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ABSTRACT

This work puts forward a framework that takes into account the roles of the languages known by an individual in explaining his labor earnings. First, two different strands of literature are surveyed: (1) the material on labor earnings determination viewed through capital, discrimination, and supply and demand type models; and (2) the works on what can be called the economics of language. An earnings equation is then put forth that includes, as an explanatory variable, language and its role as an ethnic attribute and a form of human capital. The sample used in the statistical data is then described, and a correlation of relevant economic factors is made to the income differences between English-speaking and French-speaking groups in Quebec. A statistical analysis is then detailed concerning the labor earnings of Quebec males as they relate to their education, language, and job experience. Further, attempts are made to estimate the contributions of ethnicity to differences in earnings between Anglophones and Francophones. This contribution is then compared to that found in other labor markets where ethnicity was shown to be a relevant factor. (Author/PJM)

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Differences in Earnings by Language Groups in Quebec, 1970: An Economic Analysis

François Vaillancourt

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PREFACE

The text that follows is essentially that of the Ph.D. thesis I presented at Queen's University at Kingston in the Summer of 1978. It has been slightly modified to make it more readable and to expand or correct some minor points.

The main contribution of that thesis is the fairly complete theoretical framework put forward to explain the role of language in economic activity and the exhaustive analysis of the causes of the observed earnings differences between Anglophones and Francophones in Quebec in 1970. The theoretical framework, however, is a static framework where individuals are assumed to face a society where this or that language is used for one or the other type of economic activity and to choose, in a two-language society, between using one or the other language. A more complete model would examine the dynamics of language choices and would throw some light on the factors, like immigration and capital movements, that explain in part the languages used in a society at a point in time. To examine the validity of such a model it would also be useful to have time-series data on language use and on the socio-economic status of members of the various language groups in a given society. In particular such a model would be useful in unraveling the forces that explain the evolution of the various francophone communities in North America. Such an examination of the dynamics of language choices remains a subject of analysis and reflexion.

Before ending this preface I would like to thank all the individuals both at Queen's University and at the Université de Montréal who gave me advice and encouragement when I was a graduate student at Queen's University, the Canada Council, the Quebec government and the C.R.D.E. for financial support. I would also like to thank the I.C.R.B. for publishing this text. Finally I wish to single out two individuals for special thanks: Charles Beach my supervisor, and Louise.

François Vaillancourt

Montreal, March 1979

Table of Contents

INTRODUCTION 1

CHAPTER I:

A REVIEW OF THE LITERATURE 3
The Literature on Earnings Determination 3
An Historical Overview 3
The Human Capital Approach 5
The Discrimination Model 7
The Tinbergen Approach 8

The Economics of Language 9
The Models of Language and Economic Activity 9
Some Explanations of the Difference in Earnings Between Language Groups in Quebec 14

CHAPTER II:

EARNINGS IN A BILINGUAL ECONOMY 18
A Theoretical Discussion of the Economic Role of Language 18
The Nature of Language 18
The Choices of Individuals: the Goods Market 22
The Choices of Individuals: the Labour Market 25
The Language Choice of Firms 26
The Labour Market of a Bilingual Economy 30

The Determination of Individual Earnings 33

CHAPTER III:

THE QUEBEC LABOUR MARKET 38
The Database 38

The Quebec Labour Market in 1970: Makeup and Differences in Earnings 42

The Factors Influencing the Returns to English and French in Quebec in 1970 . 45
The Population of Quebec by Language Groups 45
The Private Sector in Quebec: its Ownership by Language Groups 48
The Language of Technology in Quebec 51
The Language of the External Marketplace 52

The Use of Languages in Quebec 53

CHAPTER IV:

THE RETURNS TO LANGUAGE IN THE QUEBEC LABOUR MARKET 57
The Variables 57

The Functional Form 61

The Regression Results 62

The Returns to Language in the Quebec Labour Market: the Intercept Effects 63
The Returns to Language in the Quebec Labour Market: the Interactive Effects 72
The Industry Specific Returns to Language in the Quebec Labour Market .. 80
The Occupation Specific Returns to Language in the Quebec Labour Market 82

CHAPTER V:

NET EARNINGS DIFFERENCES BY LANGUAGE GROUPS: THE IMPACT OF HUMAN CAPITAL AND ETHNICITY 87
Net Earnings Differences, Human Capital Effects and Ethnicity Effects: Quebec and Montreal 88
Net Earnings Differentials: the Intercept Effect 88
Net Earnings Differentials: the Differing Equations Results 91
Net Earnings Differences: Age, Education and Occupation Subgroups 93
Net Earnings Differences: Age and Education Subgroups 93
The Net Returns to Language: Occupation Subgroups 95
The Net Effect of Language on Earnings: Summing Up 96

CONCLUSION 99

BIBLIOGRAPHY 102

APPENDICES

A Earnings and Earnings Ratio by Language Groups and Other Characteristics, Montreal, 1970 111
B The Definition of the Final Sample 129
C Size of Sample Used by Language and Other Characteristics, Quebec and Montreal, 1970 132
D Language Questions in the 1971 Census of Canada 144
E The Definition of the Variables 146
F The Distribution of Anglophones and Francophones by Industry and Occupation in Quebec and Montreal, 1970 151
G Additional Regression Results-I 154
H Additional Regression Results-II 166
I Gross/Net Earnings Comparisons and Human Capital/Ethnicity Breakdowns . 215

List of Tables

3.1	Industry Groupings, Final Sample	40
3.2	Occupation Groupings, Final Sample	41
3.3	Male Population of Quebec and Montreal, Classified According to Mother Tongue	42
3.4	Proportion of Males Classified According to Mother Tongue and Bilingualism, Quebec and Montreal	43
3.5	Mean Earnings, Classified According to Mother Tongue and Bilingualism, Quebec	43
3.6	Population of Quebec, According to Mother Tongue	46
3.7	Population of Montreal, According to Mother Tongue	46
3.8	Population of Quebec and Canada	48
3.9	Percentage of Employees in Firms Owned by French-Canadians, English-Canadians and Foreigners, Quebec, Early Sixties	50
3.10	Overall Percentage of Use of English by Francophones in the Workplace	53
4.1	Language Variables, Definition	58
4.2	Education Variables, Definition	58
4.3	Industry Variables, Definition	59
4.4	Occupation Variables, Definition	60
4.5	Weeks Worked Variables, Definition	60
4.6	Region Variables, Definition	61
4.7	Regression Results, Original Equation	64
4.8	Significance Test of Differences Between Language Coefficients, Original Equation	65
4.9	Regression Results, General Equation	67
4.10	Significance Test of Differences Between Language Coefficients, General Equation	69
5.1	Gross and Net Earnings Differences, Quebec and Montreal	88
5.2	The returns to Ethnicity and Human Capital, all Individuals	90
5.3	Net Earnings Differences, Earnings Equations by Linguistic Skills Groups, Quebec and Montreal	92
A-1	Mean Earnings, Classified According to Mother Tongue, Bilingualism, and Occupation, Quebec	112
A-2	Mean Earnings, Classified According to Mother Tongue, Bilingualism, and Industry, Quebec	113

A-3 Mean Earnings, Classified According to Mother Tongue, Bilingualism, and Education, Quebec 114
A-4 Mean Earnings, Classified According to Mother Tongue, Bilingualism, and Age, Quebec 115
A-5 Ratio of the Mean Earnings of Various Language Groups to the Mean Earnings of Unilingual Francophones, According to Occupation, Quebec 116
A-6 Ratio of the Mean Earnings of Various Language Groups to the Mean Earnings of Unilingual Francophones According to Industry, Quebec 117
A-7 Ratio of the Mean Earnings of Various Language Groups to the Mean Earnings of Unilingual Francophones, According to Education, Quebec 118
A-8 Ratio of the Mean Earnings of Various Language Groups to the Mean Earnings of Unilingual Francophones, According to Age, Quebec 119
A-9 Mean Earnings, According to Mother Tongue and Bilingualism, Montreal 120
A-10 Mean Earnings, According to Mother Tongue, Bilingualism, and Occupation, Montreal 121
A-11 Mean Earnings, According to Mother Tongue, Bilingualism, and Industry, Montreal 122
A-12 Mean Earnings, According to Mother Tongue, Bilingualism, and Education, Montreal 123
A-13 Mean Earnings, According to Mother Tongue, Bilingualism, and Age, Montreal 124
A-14 Ratio of the Mean Earnings of Various Linguistic Groups to the Mean Earnings of Unilingual Francophones, According to Occupation, Montreal 125
A-15 Ratio of the Mean Earnings of Various Linguistic Groups to the Mean Earnings of Unilingual Francophones, According to Industry, Montreal 126
A-16 Ratio of the Mean Earnings of Various Linguistic Groups to the Mean Earnings of Unilingual Francophones, According to Education, Montreal 127
A-17 Ratio of the Mean Earnings of Various Linguistic Groups to the Mean Earnings of Unilingual Francophones, according to Age, Montreal 128

C-1 Number of Males According to Mother Tongue, Bilingualism, and Occupation, Quebec 133
C-2 Number of Males, According to Mother Tongue, Bilingualism, and Industry, Quebec 134
C-3 Number of Males, According to Mother Tongue, Bilingualism, and Education, Quebec 135
C-4 Number of Males, According to Mother Tongue, Bilingualism, and Age, Quebec 136
C-5 Number of Males, According to Mother Tongue, Bilingualism, and Number of Weeks Worked, Quebec 137
C-6 Number of Males, According to Mother Tongue, Bilingualism, and Region, Quebec 138
C-7 Number of Males, According to Mother Tongue, Bilingualism, and Occupation, Montreal 139

C-8 Number of Males, According to Mother Tongue, Bilingualism, and Industry, Montreal 140

C-9 Number of Males, according to Mother Tongue, Bilingualism, and Education, Montreal 141

C-10 Number of Males, According to Mother Tongue, Bilingualism, and Age, Montreal 142

C-11 Number of Males, According to Mother Tongue, Bilingualism, and Number of Weeks Worked, Montreal 143

E-1 Language Variables, Definition 147

E-2 Education Variables, Definition 148

E-3 Industry Variables, Definition 148

E-4 Occupation Variables, Definition 149

E-5 Weeks Worked Variables, Definition 149

E-6 Region Variables, Definition 150

F-1 Percentage of Anglophones, and Francophones in Four Occupations for Eight Industries, Quebec 152

F-2 Percentage of Anglophones and Francophones in Four Occupations for Seven Industries, Montreal 153

G-1 Regression Results, Quebec and Montreal, The Raynauld-Marion Hypothesis .. 155

G-2 Regression Results, Quebec and Montreal, Full Year Equations 156

G-3 Regression Results, Quebec and Montreal, Industry and Occupation Variables . 158

G-4 Regression Results, Quebec and Montreal, Aged 25-64, Full Year or not 162

G-5 Significance Test of Differences Between Language Coefficients, Regressions in Tables G-1 to G-4 164

H-1 Regression Results, Four Language Groups, Quebec 167

H-2 Regression Results, Four Language Groups, Montreal 169

H-3 Results of Chow Tests, all Coefficients 171

H-4 Regression Results, with Language-Education and Language-Experience Variables 172

H-5 Regression Results, Four Age Groups, Quebec 176

H-6 Regression Results, Four Age Groups, Montreal 178

H-7 Significance Test of Differences Between Language Coefficients, Age Subgroups 180

H-8 Regression Results, Five Education Groups 182

H-9 Regression Results, Five Education Groups, Montreal 186

H-10 Significance Test of Differences Between Language Coefficients, Education Subgroups 189

H-11 Regression Results, Eight Industries, Quebec 191

H-12 Regression Results, Seven Industries, Montreal 195
H-13 Significance Test of Differences Between Language Coefficients, Industry Subgroups 199
H-14 Regression Results, Eleven Occupations, Quebec 202
H-15 Regression Results, Ten Occupations, Montreal 208
H-16 Significance Test of Differences Between Language Coefficients, Occupation Subgroups 211

I-1 Gross and Net Earnings Differences, Quebec and Montreal, Four Age Groups .. 216
I-2 Gross and Net Earnings Differences, Quebec and Montreal, Five Educational Groups 217
I-3 The Returns to Ethnicity and Human Capital, Four Age Groups 219
I-4 The Returns to Ethnicity and Human Capital, Five Educational Groups 221
I-5 Gross and Net Earnings Differences Quebec and Montreal, Eleven Occupations 224
I-6 The Returns to Ethnicity and Human Capital, Eleven Occupations 227

List of Figures

4.1 Differences in Returns to Language, According to Age, Quebec 74
4.2 Differences in Returns to Language, According to Age, Montreal 75
4.3 Differences in Returns to Language, According to Education, Quebec 77
4.4 Differences in Returns to Language, According to Education, Montreal 78

INTRODUCTION

The purpose of this thesis is to put forward a framework that takes into account the role of the languages known by an individual in explaining his labour earnings, and to then use it to study one particular bilingual labour market, that of the province of Quebec in 1970. Such a topic was chosen for two reasons. First, as the survey of literature that follows will show, no labour earnings determination model has been put forward that includes in a satisfactory fashion the knowledge of languages by an individual as an explanatory factor of his labour earnings. Secondly, the knowledge that the author has of the Quebec economy makes it a natural choice for study given that it is a bilingual labour market where substantial differences between the average level of labour earnings of its two main language groups can be observed.

In the first chapter, two different strands of the economic literature are surveyed. First the literature on labour earnings determination is reviewed with particular attention given to more recent works in the area of human capital, discrimination, and supply and demand type models. Secondly, the literature on what can be called the economics of language is examined and its weaknesses, such as the lack of strong microeconomic underpinnings, pointed out.

In the second chapter, an earnings equation is put forward that includes amongst its explanatory variables language, in such a fashion as to take into account the fact that it can be both an ethnic attribute and a form of human capital. Particular attention is given to an examination of the use that is made of language by individuals and firms in their pursuit of economic goals in a bilingual society. While both goods and labour markets are studied, it is the latter which, given the topic of this thesis, is the object of a more thorough analysis.

In the third chapter, the sample used in the analysis is described, the differences in the mean level of labour earnings in 1970 between the two main language groups in Quebec, the English-speaking group and the French-speaking group, are outlined, and a description of the various aspects of the Quebec economy that should be relevant, as argued in Chapter II, to an understanding of those income differences is undertaken. Items like the breakdown between the two language groups of the ownership of capital, the language of external markets, and the use made of one language or the other in various occupations are examined.

In the fourth chapter, the specific variables and the specific functional form used in the multiple regression analysis of the labour earnings of Quebec males are discussed. That done, the results of the multiple regression analysis of the relationship between labour earnings and explanatory factors such as education, experience, language and weeks worked are presented and discussed with particular attention paid to the coefficients of the language variables.

In the fifth and final chapter, attempts are made to estimate the contribution of ethnicity to differences in earnings between Anglophones and Francophones in Quebec; this contribution is then compared to that found in other labour markets where ethnicity was shown to be a relevant factor.

CHAPTER I

A REVIEW OF THE LITERATURE

This chapter is divided in two sections. The first one is a short survey of the literature on earnings determination that, following an overview of the earlier works in the literature, deals mainly with three frameworks that have been put forward in recent years to explain the labour earnings of individuals. These are the human capital framework, first put forward by Becker (1964), Mincer (1958) and Schultz (1961), the discrimination framework, first put forward by Becker (1957), and the supply and demand framework, often identified with its main proponent, Tinbergen (1951). A complete survey of the literature is not carried out, since it could not really add to other surveys, such as those of Lydall (1968) and Mincer (1970), and since it seems appropriate to spend more time on those specific facets of the literature that will prove useful in building a model of labour earnings determination that takes into account language as an explanatory variable.

In the second section of this chapter the literature on what shall be called from hereon the economics of language, a term first coined by Marschak (1965), is examined. Writings in that field can be assigned to one of two groups. The first one is made up of the more theoretical works, that is those concerned with the introduction of language in economic models, be they of the whole economy or of parts of it such as the labour market. The second one consists of empirical studies of the differences in the labour earnings of individuals belonging to the various ethnic and language groups in Quebec. In the survey of this literature the links - when they exist - between the theoretical models of the role of languages in the determination of individual earnings and the empirical studies, where such a role is tested for, are examined. Also studied is the relationship between the more usual models of labour earnings determination, surveyed in the first section of this chapter, and those explicitly and implicitly used in the empirical studies of the role of language in labour earnings determination.

I.1 The Literature on Earnings Determination

I.1.1 An Historical Overview

The study of the determination of income has a long history in economics.

A good review of the earlier work in that area is found in a book by Dalton (1920) which examines the work carried out by economists in that field since 1776. His review of the literature shows that Clark (1907) is correct in writing that most of the work done till the turn of the century pertains to the functional distribution of income, and not to the personal distribution of income. Indeed, in the nineteenth century, the studies that Vilfredo Pareto (1896) made of the personal distribution of income were pathbreaking and his offering of the "law of income distribution" can be seen as a turning point in the study of personal income distribution by the stimulus it brought to the discussion of the following problems: what function best represents the distribution of income across individuals, what is a proper summary measure of such a distribution, and what factors explain such a distribution of individual incomes.

Since the goal of this thesis is to explain labour earnings in a bilingual economy, the review of the literature will look at those works which attempt to answer the last of the three questions pointed out above. Before 1950 only a few authors had examined this problem, Pareto was one of them; he wrote that "... la forme de la courbe n'est pas due au hasard, cela est certain. Elle dépend probablement de la distribution des caractères physiologiques et psychologiques des hommes" (Pareto, 1902).

The rejection of a stochastic explanation of the level of individual incomes by Pareto is interesting since such an explanation was put forward later on by Gibrat (1931) and Champernowne (1973) who both view "the income determination process as a Markov process, so that one's income for this period depends only on one's income for the last period and random influences" (Blinder, 1974, p. 4). Their work was expanded upon by Kalecki (1945), Rutherford (1955) and Sargan (1957). It is not worthwhile, however, to spend much time on this part of the literature since, as Blinder puts it:

> Assuming a stochastic mechanism, no matter how complex, to be the sole determinant of income inequality is to give up before one starts. It is antithetical to the mainstream of economic theory which seeks to explain complex phenomena as the end result of deliberate choices by decision-makers. (1974, p. 7).

A rejection of chance as the only explanation of individual incomes does not mean, however, that it is not one of several explanatory factors of the level of individual incomes. This is the point made by Friedman (1953) when he puts forward a model of personal income distribution where individuals have the choice of using part of their labour earnings to enter a lottery. Depending on their utility function, some individuals will enter the lottery and others will not. Then amongst those who have entered the lottery, chance will determine those who win and those who don't. So chance influences the earnings of those individuals who choose to let it do so; some argue, however, that chance is more likely to influence the level of earnings obtained from non-human capital than the earnings gained on the labour market (Roy, 1951).

In this thesis a basically non-stochastic model of labour earnings determination will be used. It is therefore appropriate to examine those works which have attempted to provide a non-stochastic explanation of individual incomes. The first economists who attempted this were puzzled by the fact that, while income was distributed in a skewed fashion, one finds that, in Moore's

words, "industrial ability - general sagacity and energy - is distributed according to the normal or Gaussian law" (1911, p. 74). While some economists, such as Stamp (1937), argued that abilities were not normally distributed, most accepted that the distribution of income and abilities differed and that this difference had to be explained.

Two types of explanation were offered to account for the difference between the distribution of abilities and the distribution of income. The first, put forward by Moore (1911) and Pigou (1932) amongst others, is that the labour force can be divided into two or more groups of workers. Then, even if each of these groups is assumed to have normally distributed abilities, the distribution of abilities for the whole labour force will not be normal. The second explanation, put forward by Roy (1950), is that it is possible, when more than one skill determines the level of earnings, that these skills interact in a multiplicative rather than additive fashion. Then, even though each skill is normally distributed, the overall skill level of individuals, the main factor in the determination of their labour earnings, is not normally distributed.

Ability models, such as those outlined above, are essentially supply side explanations of labour earnings, a fact that led Roy to write that one must also recognize that "... the desires of the individuals in the community for various sorts of goods are naturally important." (Roy, 1951, p. 146). In other words labour demand is a derived demand, the result of the demand for goods and services faced by firms. The importance of demand factors is in dispute however; for example, Lydall (1968, p. 7) writes that

> While conditions of demand may be important in determining the earnings of particular types of labour in the short run, ..., in the long run the predominant influence is likely to be the conditions of supply... Attention has, therefore, been concentrated on discovering the factors which determine the supplies of persons to each occupation.

In the next three parts of this section the role of both supply and demand factors in explaining individual earning will be examined in greater detail. First the human capital model, a supply side model in the lineage of abilities models, is studied. Secondly the discrimination model, a demand side model, is examined. Finally the supply and demand framework, put forward by Tinbergen and his followers, is examined.

I.1.2 The Human Capital Approach

Human capital can be defined as "an individual's productive skills, talents, and knowledge" (Thurow, 1970, p. 1) used in the acquisition of income. Indeed Becker defines investments in human capital as "... activities that influence future monetary and psychic income by increasing the resources in people" (1964, p. 9). He further classifies these activities as on-the-job training, both general and specific, schooling, other knowledge, and health (Becker, 1964). On-the-job training occurs when "... workers increase their productivity by learning new skills and perfecting old ones while on the job" (Becker, 1964, p. 17). Furthermore, Becker specifies that for on-the-job training to be general, it must be "... useful in many firms besides those providing it..." (1964, p. 19) while specific training "... can be defined

as training that has no effect on the productivity of trainees that would be useful in other firms..." (1964, p. 26). As to schooling, it is defined as training acquired at an institution that specializes in the production of training rather than in the production of goods while "other knowledge" is defined as information on prices, wages, employment opportunities, and the like.

Since individuals have a choice between various types of human capital, and also between human and non-human capital when they make investment decisions, it is important to examine what explains their choices. As Mincer puts it "... individuals undertake various amounts of training in the expectation that their occupational incomes in the future will be sufficiently large to compensate for the cost of training..." (1970, p. 7), with costs defined so as to include both direct costs and foregone earnings. Between various types of investment in human and non-human capital, individuals will choose the investment with the highest net present value.

It is important, however, to be aware that the stock of human capital that an individual is endowed with is usually not entirely the result of his own investment decisions. In fact, parents bequeath various types of human capital to their children, and society often requires that children acquire various types of human capital. Parental bequests can be classified as being either of a genetic nature or of a time-using nature. The genetic bequest determines such things as race, strength, appearance and basic intelligence while time-using bequests include the skills, such as language and motricity, that the parents usually teach their children. While genetic bequests are necessarily the gift of natural parents, those rearing the child, parents or legal guardians, are responsible for time-using bequests. As to society, it both forces upon the child, through such actions as compulsory schooling and compulsory vaccines, and offers the child, through services like community centers and libraries, some human capital.

The study of the decisions of parents and society to invest in their children has not until recently been part of the human capital literature. Little has been done on parental choices although Ishikawa (1975) has put forward interesting explanations of the choice by parents of the amount of time and money to be invested in their child. As to society's choices, their importance has been recognized (Becker, 1964) but little has been said as to how expenditures that bring about the formation of human capital are decided. Furthermore, it has been found difficult to distinguish between the influence of the genetic bequest, nature, and of the time-using bequest, nurture, and also difficult to distinguish between the influence of bequeathed capital and acquired capital on earnings (Behram and Taubman, 1976; Taubman, 1976).

So individuals are, at a point in time, endowed with various types of human capital; part of it, such as higher education and job related training, is the result of choices they have made and part of it, such as their mother tongue and a minimum compulsory amount of schooling, is the result of choices made by others. Does this human capital earn positive returns? A great number of empirical studies have been carried out, looking in particular at schooling and at on-the-job training to estimate the return to human capital investment. It is impossible to review them here but their main results will be pointed out when appropriate in this thesis.

I.1.3 The Discrimination Model

An individual can be said to practice discrimination in the labour market when he prefers not to work with some individuals, usually linked by a common bond of race or ethnicity. As Becker puts it: "If an individual has a 'taste for discrimination' he must act as if he were willing to pay something, either directly or in the form of a reduced income to be associated with some persons instead of others" (1957, p. 14). While the human capital model can be seen as being in the lineage of the abilities models of earnings determination, the discrimination literature is, with the exception of Edgeworth's work (1922), a product of the recent interest in the United States in explaining the differences in earnings between the blacks and whites of that country. Indeed, except for Krueger's work (1963), Becker's work was generally neglected until the mid-sixties.

While in the human capital literature the debate has been on the returns to and choice of various types of investments, in the discrimination literature the debate has centered on finding an appropriate rationale for discriminatory behavior. The reason for this is that some economists hold the view that discrimination is not a true economic behavior and that, in the long run, it must disappear. For example, Arrow writes that

> The less discriminatory will either drive the more discriminatory out of business or, if not, will cause the wage difference to fall. If we suppose that there are some actual or potential employers who do not discriminate at all then the wage difference should, in the long run, fall to zero. The discriminating employers may possibly continue to operate, but they will employ only white labour (1972, p. 90).

Three explanations have been offered in the literature to account for the persistence of discriminatory behavior through time. The first is that discrimination is, in fact, screening or statistical discrimination, the second is that employees impose upon employers their taste for discrimination, and the third that employers have a taste for discrimination that leads them to foresake profits.

Screening is an idea that was put forward amongst others by Arrow (1972). It simply says that employers use easily ascertained characteristics of prospective employees, such as the diplomas they hold, the color of their skin, or their sex, to evaluate the likelihood that they are endowed with other characteristics less easily observed. In the case of blacks, Arrow argues that employers associate with being black a low quality of education and wrong attitudes towards work. In other words "... if the subjective probability in the mind of an employer that a white is qualified is higher than that a black worker is qualified, there will have to be a wage difference if the employer is to hire any blacks at all" (Arrow, 1972, p. 97).

So employers are not discriminating against blacks because they are black. They are simply trying to maximize profits, and to do so, are using information about the probable performance of their work force, information conveyed by the color of the skin of applicants and employees. It may be that the assumed correlation between the color of the skin and productive capaci-

ties does not hold: then discriminatory-like behavior is the result of the pursuit of profit maximization with false information as input.

The second explanation of discrimination is that while employers have no reason to practice discrimination themselves, they do so because it is imposed upon them in various ways by their workers. As Pleeter puts it, discrimination will occur "... if there is a possibility that hiring blacks will create turmoil between black and white employees with a concomitant loss in productivity" (1974, p. 85). As to the type of discrimination it may be either in wages or, as Bergmann (1971) argues is more likely, in access to more valued occupations. Once more, profit maximization is the driving force behind discrimination.

The third explanation of discrimination is that employers have a taste for it so that their utility function includes not only profits but some amount of discrimination. Such a taste for discrimination may have different sources. Krueger (1963) argues that white employers try to maximize the income of the entire white community and not only theirs, while Alexis (1973) believes that employers have a utility function in which the relative position of both blacks and whites in society enters. In both cases, the result will be discrimination against blacks by white employers, both in terms of wages paid and of hiring policies, the motive being utility maximization rather than profit maximization.

So discrimination means that individuals of a given group are less in demand than others as employees even though they have the same amount of human capital. It will be hard, however, to discover through the observation of discriminatory behavior if it is the result of a taste for discrimination or of a sreening mechanism. Be that as it may, a fair number of studies have been made in the United States to measure the importance of discrimination against blacks and females in that country and some of their results will, when appropriate, be used in this thesis.

I.1.4 The Tinbergen Approach

The Tinbergen approach can be defined as one where both supply and demand considerations are explicitly taken into account when a study of the determination of labour earnings is undertaken. It was first put forward by Tinbergen at the beginning of the fifties and remains identified with him. Tinbergen wrote that "... a systematic study of the problems of income distribution may conveniently start by distinguishing between the supply side and the demand side of the labour market" (1951, p. 106).

The model first put forward by Tinbergen has not been used widely by economists working on the explanation of labour earnings. Houthakker (1974) argues that Tinbergen's idea was a valid and useful one; he did not, however, use it. As to Hartog (1975) and Sattinger (1975), they have attempted to better flesh out the model, but have stopped short of testing it out. Sattinger studies the matching up of labour of various grades with jobs of various difficulty levels, relating "... wage differentials, and hence the distribution of earnings, to the allocation of labour to the task" (1975, p. 459).

While Sattinger takes the grade of labour as given, Hartog examines why various grades of labour are found in the labour market. He argues that individuals are endowed with various capabilities, which can also be called

basic skills, and that they combine them in various ways so as to supply a given grade of labour. Depending on their various basic skills and on the different combinations open to them, individuals will be able to supply one or more grade of labour, choosing to supply the grade of labour for which the rewards are the highest.

While no discussion of how individuals become endowed with basic capabilities is found in the Tinbergen approach, it seems plausible that as in the case of human capital, the choices of various agents are the relevant factor. Hence, the Tinbergen framework does not replace the human capital framework, but attempts to better model the importance of market forces in explaining individual earnings. This formalizes what Mincer recognized when he wrote that his earnings equation is "... a reduced form equation in which both demand conditions and supply responses determine the levels of investment in human capital, rates of return and time worked" (1974, p. 137).

No empirical studies have been made using explicitly the Tinbergen framework. However, the results of empirical studies of the returns to human capital can be, and should be, looked at with more attention paid to underlying demand factors.

I.2 The Economics of Language

The study of language by economists is a recent phenomenon and, except for Marschak's neglected article (1965), is the result of the interest shown in explaining the differences in labour earnings of English-speaking and French-speaking Canadians. This literature has grown in isolation from the work of sociolinguistics and language planners, such as Josuah Fishman of Yeshiva University, and has ignored the few attempts of that literature to use economic analysis (Jernudd, 1971).

Contributions to the literature on the economics of language are of two types: theoretical contributions that attempt to model the role of language in economic activity, and empirical contributions that look at the role of language in explaining earnings differentials in Quebec. In general papers fall in one category or the other and are therefore reviewed below the appropriate heading; when a paper makes a contribution to both parts of the literature, the appropriate items are reviewed under each heading.

I.2.1 The Models of Language and Economic Activity

Marschak (1965) was the first economist the author is aware of to examine language from an economic perspective. He argued that the most efficient languages would survive through time and that, in general, those languages would be characterized by as short as possible a word being used, given the amount of information to be transmitted. In other words, individuals would minimize the time cost of information transmission. Marschak did not discuss more precisely the role of language in various economic activities and his work appears to have been neglected by all other authors in the field of the economics of language.

The first author to explicitely put forward a model of the role of language in economic activity was Migué (1970). His work on the labour market can be seen as an attempt to provide an economic explanation of the differences in labour earnings between ethnic groups in Quebec that were documented

in the Report of the Royal Commission on Bilingualism and Biculturalism (Canada, 1969).

Migué pointed out that the share of French-Canadians in top-level jobs in Quebec was less than their share of the population and that this could in part explain the differences in earnings. Migué then put forward a model to explain the difference in access to top-level jobs; this model uses the framework of the economics of information, first put forward by Stigler (1961). Migué's argument is that since owners and top managers of many entreprises in Quebec are Anglophones, Francophones will not be able to gain as easy an access to top-level jobs as Anglophones, a result of less information being, on average, available about them than about Anglophones to those responsible for top-level hiring and promoting. This lack of information by top management about Francophones is the result of both groups belonging to different information networks. These networks are embodied in different schools, universities, nd community organizations. As a result, Migué states that:

> "Pour une productivité marginale par ailleurs égale entre le travailleur francophone et le travailleur anglophone, ce dernier obtiendra l'emploi car le coût marginal de son recrutement en sera plus faible". (1970, p. 190).

Migué was the first economist to put forward a model of the role of language in one specific market, the labour market. His model is interesting in that it stresses the role of information as a source of wage differentials. However, Migué's model is one where language is treated as an ethnic attribute which distinguishes available information networks while the role of language as an input in the production process of firms is completely left aside, so that, in a sense, firms are assumed to choose between Anglophones and Francophones because of what they know about them and not because of their language skills, given an equal endowment of other skills. This is the major weakness in Migué's analysis. Another weakness is that he does not integrate his labour market into a model of the whole economy.

Two other models have been put forward that attempt to examine simultaneously the role of language in both labour and goods market. They were developed independently of each other by Hocevar (1975) and Breton and Mieszkowski (1975); we shall first examine the work of Breton and Mieszkowski. Their paper is divided in two main parts: the first looks at the theoretical aspects of "the economics of bilingualism", while the second examines the possible impact of the Official Language Act, passed in 1974 and better known as Bill 22, on the Quebec economy. The first part of that paper is reproduced in the main in a more recent text (1977), with only the discussion on the choice by the firms of a language of internal communications being omitted.

In the goods market, Breton and Mieszkowski use a simple two-by-two standard international trade model, treating language as a barrier to trade, similar to distance. They find that when traders learn a new language, therefore giving them access to a new market, then, if price differentials existed between the two markets, both language groups will benefit from trade if it takes place. This is a standard trade theory result, which also holds in a world where there are more than two language groups. However, in a multilanguage world, they argue that efficiency considerations will bring about the emergence of a dominant trading language, usually that of the bigger or

more powerful country.

Breton and Mieszkowski point out that there may be differences "... in the language component of commodities that enter into international trade" (1975, p. 4) so that the knowledge of language required for trade varies, depending on what goods are traded. They also point out that languages may be dissimilar and that the cost of learning a language will be greater when the dissimilarity between the mother tongue and the language being learned is greater.

As to the impact of language choices on the labour market, Breton and Mieszkowski argue that four factors explain the choice of the working language of a firm, that choice affecting its demand for labour. They are the linguistic origin of factor supplies, particularly labour, the weight of external and internal transactions, the numbers of languages used in external communication and the language component of the goods or services transacted. They do not elaborate, however, as to the precise weights of these four factors in the choice of various firms, nor do they discuss why some individuals are bilingual, and others are not. They do point out, however, that traders are bilingual because they made a conscious investment decision, given the trade opportunities, or because they were already bilingual before becoming traders. In that case, a skill acquired for consumption purposes brings the individuals unexpected monetary returns. Finally, they point out that those individuals whose mother tongue is the dominant language, either in international trade or as the working language of firms, will reap gains alike those of seignorage.

The contribution of Breton and Mieszkowski to the economics of language is an interesting one, particularly since it uses a general equilibrium approach in tackling the problem. However, it has some weaknesses. In the goods market, the assumption that language is a barrier to trade is correct; it fails, however, to take into account the role of language in the production activities of households. To state that "... the more important is language as a barrier to trade, the smaller will be the language component of the goods that are exchanged between countries..." (1975, p. 5) is misleading. That statement confuses the role of language in trade and the role of language in the use of a product. Indeed, one is inclined to believe that it is the language component of the goods, which "... is related to the extent to which the instructions for the use of the product are important, to the nature of the servicing and repair, and to other such factors..." (1975, p. 51), that determines the amount of trade between two language groups, given the language skills and the value of time of these two groups rather than the language barrier to trade per se. The role of language in the home production process, a fact not well recognized in the literature, will be discussed in greater detail in the following chapter.

When discussing the goods market, Breton and Mieszkowski implicitly assumed that "... all internal communications within a firm located in a particular country are in the native tongue of the citizens of that country..." (1975, p. 15). They then argued that this may not be the case and that there may be a link "... between the choice of language for foreign trade (external communications) and the day to day operations of the firms (internal communications)..." (1975, p. 15). This emphasis on the language of trade leads the authors to neglect the fact that both the ownership of a firm and the language of the production technologies that it uses are of importance in explaining

its language choices. They also fail to point out the links between the goods and labour markets, but they state that the absolute size of various language groups may explain why one language is dominant. This fails to take into account differences in purchasing power between various language groups.

Finally let us note that Breton has taken up the same argument found in the papers examined above in a more recent paper (Breton, 1978). In that paper, he also points out explicitly that language is a form of human capital. He also argues in that paper that, as one goes up the hierarchy of a firm, one must master even more correctly than before the language used in the firm.

Hocevar's model is the only other one in the literature on the economics of language where a general equilibrium approach is used in an attempt to integrate language in economic activities. Indeed, he attempts to explicitly link goods and labour markets in an economy made up of two language groups, the Y-speaking majority and the X-speaking minority.

In the goods markets, Hocevar assumes that on the demand side "... the speaker of language X will prefer the X-language specific product, Ax, over the Y-language specific product, Ay ..." (1975, p. 339). Such a preference will, in Hocevar's model, result in the X-speaking individual choosing the Ax good only if Ax is priced at a level equal or lower than Ay. On the supply side he examines under what conditions either Ax or Ay or both will be produced. Two cases arise: first, if economies of scales are important in the production of A and if the size of the language groups is such that economies of scales cannot be attained in the production of Ax, then Ax will be costlier than Ay, which in Hocevar's model means that it will not be demanded. The second case is the one where firms must use a production technology with indivisibilities; then it is quite possible that some firms will have excess capacity, given the size of the Y-speaking market, and that they will be willing to produce the Ax good as long as by doing so they can cover their variable costs and a part of their fixed costs. Finally, Hocevar argues that in the case of public goods, the level of production of minority public goods depends not only on what they cost, but also on the political arrangements in a given country, and on the degree of interdependence between the utility functions of the members of the X and Y groups. If Y-individuals are willing to accept only a limited production of X-language public goods, this will influence the level actually produced.

Hocevar studies not only the labour market but also the capital market when he examines the role of language in the demand for and supply of factors. He is the only author to do so. For both factors he argues that

> "... minority-specific market demand and the provision of minority-specific public services taken together determine the demand for factors specialized in minority-specific production" (1975, p. 347).

He is careful to point out, however, that:

> "The exact factor proportions will depend in each case upon the importance of linguistically specific processes in the total production process and upon relative prices of the two linguistically specialized factors" (1975, p. 349).

In the case of labour, Hocevar argues that, since demand for a given grade of labour is differentiated linguistically, there is no reason why two individuals endowed with the same amount of human capital, except for their language knowledge, should receive the same wage. Differences in wages, if they exist, will depend on the difference in demand for the language specific goods, which leads to a difference in the derived demand for labour, and on the difference in the supply of various grades of labour by both language communities.

In the case of capital, Hocevar states that:

> "... with the exception of a few physical assets, capital per se can be considered as linguistically neutral" (1975, p. 352).

He argues, however, that Y-controlled capital may not be forthcoming to X entrepreneurs, because there are problems in the flow of information between the two groups, or because Y capitalists have preference functions such that they do not wish to see X-type goods offered. This does not mean, however, that Y employers are not

> "... perfectly happy to hire minority specialized labour at the wage paid the majority labor, provided job requirements are linguistically neutral. The latter, incidentally, is more likely to be the case in low-paying jobs than in managerial positions" (1975, p. 353).

Indeed, he expects to find linguistic segregation within firms with some production units made up of members of the minority group and others made up of members of the majority group.

Hocevar's model is a fairly complete model of the role of language in economic activity and it points out several interesting results. In particular the explanations of differences in the mean earnings of language groups as being the result of differences in the demand for and supply of a specific language skill is an interesting result. Up to now empirical studies of earnings differential have, as it is shown in the following pages, relied heavily on discrimination, statistical or real, as an explanation of earnings differences. Hocevar's result offers an alternative explanation. However, some weaknesses remain as the following comments indicate.

In the goods market, Hocevar implicitly assumes either that language is irrelevant in the acquisition and consumption process of goods or that all individuals in the minority group are fully bilingual. Such an assumption must have been made to obtain as a result that individuals of the X-language group will prefer X-goods if and only if they are no more expensive than Y-goods. Indeed, such a preference is really no preference at all since there is no cost to exercising it. However, as it will be argued in Chapter II, even if X-individuals have no true preference for X-goods they should still be prepared to pay more for X-goods than for Y-goods if they are not fully bilingual since consuming Y rather than X goods requires a greater input of time.

In the labour market, Hocevar assumes that the production of minority goods requires minority factors. The reason for this is not spelled out but

presumably it is the case that a knowledge of the minority language is required. However, if Y firms produce the X product, it may be the case that X individuals must be bilingual to work with them but that Y individuals need not be bilingual. This is not examined by Hocevar, nor is there any discussion as to the link between the degree of bilingualism and the access it gives to various occupations.

In the capital market, Hocevar assumes that there are very few cases where physical capital has a linguistic content. This seems a difficult position to maintain when the importance of instructions, repair manuals and maintenance manuals in using physical capital is taken into account. After all, even engraved instructions are often important in the operation of equipment and machinery.

All of the criticism levied above are on specific parts of the model. A more general criticism is that Hocevar equates numerical minority with economic and political minority. A more general model would take that into account and would also examine the importance for a given minority group of the degree of usage of its language in the world economy. This point was brought up by Breton and Mieszkowski and is a valid one since economies of scale on a world level may also be a relevant factor in explaining the production of language specific goods. Finally, Hocevar does not examine the decisions of individuals to invest in different languages, a decision that can be looked at through the human capital framework.

I.2.2 Some Explanations of the Difference in Earnings between Language Groups in Quebec

Only one of the three theoretical models described above, that of Migué, has been submitted to any kind of empirical test. However, other explanations have been offered of the differences in income between language groups in Quebec. In this part of the chapter, these attempts are reviewed.

Empirical studies of the role of language in the Quebec labour market can be classified as descriptive or analytical with the studies examining differences in earnings, access to occupations and use of French and English in the workplace. Some of the descriptive studies will be used later on in this thesis when a more complete description of the language dimension of the Quebec economy is undertaken. For now the results of analytical studies of earnings differences between French and English-speaking Quebeckers are reported. All of these studies deal with income difference for the period 1960-1970. In the entire period, roughly eighty percent of the population of Quebec was French-speaking, the majority unilingual; in the Montreal area, about sixty-five percent of the population was French-speaking. In 1960 English-speaking Quebeckers, Anglophones, earned on average about fifty percent more than French-speaking Quebeckers, Francophones; in 1970, the gross difference was thirty percent (Vaillancourt, 1978).

The first analysis, and indeed documentation (1), of differences in the labour earnings of Anglophones and Francophones in Quebec was made by three economists working for the Royal Commission on Bilingualism and Biculturalism in the late sixties. The broad outline of their results is found in the final report of that Commission but their work as such was never published. An unpublished document is available in various university libraries but even it does not contain all the empirical work carried out. As a result,

it is impossible to review or criticize that study. What will be reported are the results found in the final report of the Commission.

In the report of the Royal Commission on Bilingualism and Biculturalism, the results of two regression analyses, carried out using 1961 Census data, are reported. In the first analysis, the earnings of members of specific professions, such as doctors and engineers, residing in the Montreal area in 1961 were analysed. The amount of earnings was the dependent variable in the regression equation and age, ethnic origin, and education in the case of engineers, were the independent variable; having examined the results of the analysis, the authors of the report state that "... ethnicity is not an important cause of income differences among clearly defined professions" (Canada, 1969, p. 68).

In the second analysis, the earnings of a group of 100,000 males residing in the Montreal area in 1961 were analysed. The actual amount of earnings was the dependent variable in a regression analysis with age, education, occupation, industry, period of immigration, bilingualism and ethnicity as independent variables. The analysis led the Commission to conclude that "... individual bilingualism by itself does not at present necessarily result in any economic reward..." and that there are "... two major income categories, one including Canadians of English-Scottish, Irish and Northern European origin, where ethnicity increases average earnings, and the other, including Canadians of French, Italian, Eastern European and other origins where ethnicity reduces average earnings" (Canada, 1969, p. 75, 77). Hence, the conclusion that age and occupation are the most important factors in explaining individual earnings and that "... bilingualism, period of immigration, and the factors related to ethnicity have a secondary although still significant influence. These are the results of a purely statistical analysis..." (Canada, 1969, p. 78). The results of the analysis show that Quebeckers of English-Scottish origin earn almost twenty percent more than French-Canadians. This is the difference in "... the average wage and salary which is attributable to ethnic origin, all other factors being held constant..." (Canada, 1969, p. 77).

The work done by Messrs Raynauld, Marion, and Beland for the Royal Commission on Bilingualism and Biculturalism is the first empirical study that attempts to explain labour earnings differentials between language groups in the Quebec labour market. It is therefore unfortunate that such basic information as t-statistics and R^2s are not available for analysis and comment. Still, one can note that no economic model is offered as an explanation of the results found in the analysis.

Two of the researchers of the Royal Commission on Bilingualism and Biculturalism did attempt to provide, later on, some economic explanation of the differences in labour earnings they had observed. Raynauld and Marion (1972) choose to use a discrimination framework and, having divided the Quebec economy into two sectors, English (E) and French (F), they calculate the capital and labour belonging to each community. They then enter these proportions in a Becker-like discrimination model, calculate the expected difference between the total earnings of both ethnic groups, and compare it with the observed difference. They found that, while E capitalists were not witholding enough capital from the F sector so as to truly maximize the total income of the E groups, the observed differential in income was compatible

with plausible values for a Becker-like model.

Raynauld and Marion manipulate correctly the Becker model, but their choice of it to explain labour earnings differentials in Quebec is surprising, since Becker's model is appropriate when the capital and the workers of each group are of the same quality. In Quebec, the Royal Commission on Bilingualism and Biculturalism established that Francophones are less educated than Anglophones (Canada, 1969, p. 28). Hence using a model that assumes the contrary seems somewhat inappropriate: indeed, Raynauld and Marion will point to this lack of homogeneity of labour as an explanation of their failure to explain fully the differences in earnings between the two main language groups in Quebec.

Raynauld and Marion also point out, but do not explain why there is a "... concentration de groupes ethniques dans certaines catégories professionnelles. Cette viscosité des groupes occupationnels résulte de la complémentarité qui existe entre le capital et le travail appartenant à un même groupe ethnique" (Raynauld and Marion, 1972, p. 16). Such a phenomenon is predicted by Hocevar's model which states that capitalists prefer dealing with managers of their own language group (Hocevar, 1975).

As indicated above, another possible explanation of differences in earnings between language groups is that members of both groups do not belong to the same information network. This explanation was put forward by Migué, who then attempted to test it. He argues that, for a given occupation, his model predicts that the dispersion of wages would be higher in Quebec than in Ontario. This is the result of firms not being so well informed about employees in Quebec as in Ontario, and therefore hiring Francophones over a broader pay scale since they are less sure of their capacities. Migué uses data from the Pay Research Bureau and indeed finds a greater dispersion in Quebec than in Ontario for at least some occupations, a result somewhat at odds with the predictions of the theory (Spence, 1974), but one that supports his predictions.

Migué's test of his model is not conclusive, however, since he neglects to control for differences in the industrial structure and in the educational attainment of the workers of the two provinces. Differences in these two factors, rather than the existence of two information network in Quebec and one in Ontario, could explain the differences in wage dispersion. His idea is an interesting one, however, which should not be dismissed for lack of an adequate empirical test.

The three studies reviewed above are the only completed studies on differences in labour earnings in Quebec between language groups. There is work currently being done at the Economic Council of Canada by Mr Boulet; that work is a remake of the work of Messrs Raynault, Marion and Beland. Boulet examines the earnings of males for the Montreal area for 1960 and 1970 using actual earnings as his dependent variable and age, education, weeks worked, occupation, period of immigration, marital status, mother tongue and bilingualism as explanatory factors.

To summarize, the only empirical study that specifically examines the impact of ethnicity on the earnings of Quebeckers was carried out with little thought given to the appropriate model of the economic role of language. It

used a rather weak human capital equation, where age, rather than age corrected by years of schooling, is the experience variable, where experience squared is missing, where weeks worked are missing and where language is equated with ethnicity. In general, empirical studies of the role of language in the determination of the economic status of individuals in a bilingual economy are not numerous, do not make use of the knowledge gained in empirical studies (Mincer, 1974) of the role of human capital in explaining labour earnings, and do not draw extensively on the existing theoretical models of the role of language in an economy.

Given this state of the literature on the economics of language, it seems appropriate in the following chapters to put forward a more complete analysis of the role of language in an economy, to then put forward a theoretical framework which can be used as an underpinning for an earnings equation where language enters and to submit, as much as possible, that equation to an empirical test. The first two points are carried out, drawing on both the literature on earnings determination and the literature on the economics of language, in the next chapter.

REFERENCES

(1) Information for Montreal only can be found in Family Income and Expenditure in Canada 1937-1938, Dominion Bureau of Statistics, Ottawa: King's Printer, 1941.

(2) The paragraph is based on a conversation with Jac-André Boulet on the first of April 1978. The study will probably be published in the fall of 1979.

CHAPTER II

EARNINGS IN A BILINGUAL ECONOMY

In Chapter I, it was shown that detailed theoretical explanations have been offered as to the link between the usual forms of human capital, such as education and experience, and individual earnings, as well as between discrimination and earnings, but that no such detailed explanation has been put forward as to the link between language and labour earnings. The reason for this is that the attempts to provide a theoretical framework that is useful in understanding the role of language in economic activity lack a clear understanding of the nature of language and a good analysis of the language choices of micro-economic agents.

While it is not the goal of this thesis to develop a formal model of the role of language in economic activity, it is necessary to put forward a sound theoretical framework that will allow us to better understand the role of language in the determination of individual earnings. This is done in the first part of the chapter, using existing models of the behavior of individuals and firms. So, after a discussion on the nature of language, the first part of this chapter is given over, first to the discussion of the language choices of individuals as consumers and workers, then to a discussion of the language choices of firms as producers of goods and services and as employers, and finally to a discussion of the labour market in a bilingual economy. This must be done if the impact of language on labour earnings, the relationship that is the specific object of study in this thesis, is to be established. Once this relationship is established, it is integrated, in the second part of this chapter, in a more complete model of individual earnings determination that draws on the theoretical models highlighted in Chapter I.

II.1 A Theoretical Discussion of the Economic Role of Language

II.1.1 The Nature of Language

It would be somewhat presumptuous for economists to define language *ab initio* given the amount of research done on language by, amongst other, anthropologists, linguists, and philosophers. A generally accepted definition is "... a distinctively human system of communication based on oral symbols..." (Spencer, 1964). Such a definition brings out the fact that language

is a mean of communicating information between individuals. Here, it is assumed that the languages used by individuals are a system of both vocal and written symbols, and that they are complete, in that each real world situation can be described in it. This is an important condition; it precludes the situation where an individual, having to choose between two languages, chooses one of them because it is more useful strictly from a communication point of view. In other words, it is assumed in this analysis of the role of language in economic activity that one language is not intrinsically superior to the other.

In this analysis of the economic role of language, it is also assumed that individuals have a minimum level of fluency in their mother tongue and in any other language they may know. However, the minimum level of fluency of an individual in his mother tongue is assumed to be higher than his minimum level of fluency in a second language. Furthermore it is assumed that, on average, individuals who are of the X-mother tongue are more fluent in the X-language than individuals of another mother tongue who learned the X-language as a second language.

Given the nature of language, and given the definition of general human capital (Becker, 1964), it seems appropriate to state that language is a form of general human capital since it is a skill whose acquisition will bring an individual consumption or investment benefits, or both. For example, a knowledge of language is required for the consumption per se of such cultural goods as novels, poems or songs; it is also combined with goods and time to permit the consumption of goods, such as meals cooked using recipes. As to investment benefits, language is often used by individuals to provide their services to their employers in exchange of wages. Finally, it is also used by individuals to acquire other human capital, such as education and on-the-job training.

While all the languages known by an individual are part of his stock of human capital, one of them, his mother tongue, plays a second role in the individual's life since it contributes in defining his ethnic group. By ethnic group is meant "... a social group which, within a larger cultural and social system, claims or is accorded a special status in terms of a complex of traits..., prominent among them are those drawn from the religious and linguistic characteristics of the social group, the distinctive skin pigmentation of its members, their national or geographic origins or those of their forebears..." (1) (Tumin, 1964). The relative importance of these factors will, of course, vary across societies. However, the mother tongue of an individual is usually closely linked to the values, norms, and customs which determine the ethnic background of an individual; as Hocevar puts it, there is "... a correspondence between linguistic identity and other cultural elements". (Hocevar, 1975b, p. 31). While both the contribution to his human capital and the contribution to his ethnicity of his mother tongue have an independent impact on an individual's earnings, they also have a combined impact since they jointly influence the nature of his information network. Individuals will associate themselves with other members of their ethnic group because they can converse more easily with them than with members of other ethnic groups and because they share common values. Their greater base of communication is the result of their mastery of a common language capital, their mother tongue, that is greater than their mastery of other languages, while their common values are the result of their belonging to the same ethnic

group, a group defined in part by their mother tongue. Migué, when he examined the role of information networks in explaining individual earnings, referred mainly to ethnicity as the determinant of information networks (Migué, 1970) and neglected the role of linguistic human capital.

The fact that language can be both a form of human capital and a determinant of ethnicity has not been generally acknowledged in the literature on the economics of language. Both Migué (1970) and Raynauld and Marion (1972) treat language as an ethnic characteristic while Breton and Mieszkowski (1975) and Breton (1978) treat it as a type of human capital, useful in the purchase of goods and in the accomplishment of work related tasks. As to Hocevar (1975), he treats language as an ethnic characteristic of goods and as a type of human capital useful in work-related activities. In other words, none of these authors recognizes that language is general human capital that, depending on market forces, can bring a return when used in such activities as consumption, investment and work. Indeed, it is necessary for individuals in most activities to master a language so as to be able to sell their other skills to employers. It must also be recognized that, while all the languages known by an individual are part of his human capital, his mother tongue is also linked to his ethnicity: hence his mother tongue has two effects, possibly of opposite signs, on his earnings while his knowledge of other languages cannot reduce his earnings but need not increase them.

The mechanism of acquisition of languages by individuals is similar to that of other types of human capital; that is, parents, society, and individuals all have an impact on their stock of language capital at a given point in time. The mother tongue of an individual is chosen by his parents who may also decide to have him learn other languages either during his school years or possibly before them. The choice of a mother tongue for a child will of course be limited by the parents' language skills since it must be a language that at least one and generally both parents understand. However, other languages may be acquired by private lessons or through playing with friends. The reason for the parents choosing one mother tongue rather than another, if they have the choice, or having their child learn a second language in his youth, will not be explored here, but, presumably, both pride in their ethnic heritage and economic motivations will affect their choice. Whatever the motive, they will choose a mother tongue and possibly other languages with which to endow their child.

Society will also play a role in determining the languages known by a child. The language used for teaching purposes throughout the period of compulsory schooling will have to be known by him; it may be his mother tongue, another language he knows, or a language he has not learned in childhood. He may also acquire other languages, through compulsory or elective courses. As a result of this, an individual reaches adulthood endowed with at least one language, in most cases his mother tongue (2), and possibly one or more other languages.

Individuals can decide to let depreciate, maintain or add to the stock of language they entered adulthood with. If some languages learned during childhood bring no economic rewards because there are no consumption activities or employment opportunities where they are used, then individuals may cease using them, which can lead to the decay of that language (Breton, 1978). More likely is that individuals will maintain, either because of inertia or because of

non-economic motivations, languages they already know and will learn others. The criterion for choosing a specific language amongst various types of possible investment is assumed to be the usual one, that is the maximization of present value; either consumption or investment benefits can bring this about. Indeed, language may be a useful asset in giving access to new markets for both goods and labour. In that case, language is somewhat akin to migration in enhancing employment opportunities with linguistic mobility replacing geographic mobility in societies where at least two languages are commonly used.

So language, as human capital, will bring positive or at worst zero benefit to individuals. In general, investments made by individuals on their own free will should bring positive benefits which can manifest themselves through higher earnings. This does not mean, however, that the mother tongue of an individual, in its role as an ethnic determinant, cannot have a negative impact on an individual's earnings. This would be the case if that ethnic group was discriminated against (Becker, 1957), if ethnicity was used as a screening mechanism (Arrow, 1972), or if ethnicity, as argued above, implied that individuals belong to a different information network so that there is a real cost to firms wishing to hire them (Migué, 1970).

The role of language in both the goods and labour markets and, more specifically, its impact on earnings will be discussed in the following parts of this chapter. It will be determined by such factors as the absolute size of a linguistic group in a given labour market and in the surrounding markets, by the customs and laws regarding the usage of language in a society, by other market forces such as the origin of technology or managerial knowledge, and by the preferences of individuals in their role as consumers, workers, and entrepreneurs.

In the discussion of the role of language in economic activity, it will be assumed that individuals choose to use their mother tongue in various economic activities. Two assumptions can be made that explain this behaviour. The first is that they have a pure preference for doing so: that means that they are willing to pay more, everything else being equal, for goods in their own language and are also willing to earn less, everything else being equal, for working in their own language. In other words members of different ethnic groups have utility functions such that they prefer using their mother tongue rather than any other language, even if fully bilingual.

The second assumption that can explain the choice by individuals of their mother tongue is, as was argued above, that they are more fluent in that language. In other words most individuals, even if they are bilingual, still master best their mother tongue (3); only in rare cases of full bilingualism would individuals master equally well a second language. This assumption seems reasonable since one's mother tongue is the first language learned and since it is normally used quite extensively in the child's early years. This means that his experience with, and knowledge of, his mother tongue will be greater than his stock of knowledge of other languages. The individual will then, by using his mother tongue, use less time to convey information with precision, and do so with a lesser likelihood of error and possible embarrassment. Indeed individuals, unless they are quite fluent in their second language, will normally first think out their sentences in their mother tongue, translate it in their mind, and then say it out loud: this will necessarily

take more time than using directly one's mother tongue. Also, and this again depends on the fluency of an individual in his second language, when an individual uses a second language, some of the nuances that he wishes to convey or comprehend may be lost. Finally, again depending on his level of fluency in his second language, the possibility of embarrassment to an individual as a result of not using the proper word increases when he is not using his mother tongue.

Given that individuals choose to use their mother tongue, the impact of such a choice in both the goods and labour market will be studied next. To facilitate the discussion, we shall first examine the behaviour of individuals, then the behaviour of firms, and finally we shall see how they interact in a market framework, with particular attention given to the labour market.

II.1.2 The Choices of Individuals: the Goods Market

In this section, the choice of goods by individuals is examined. The reason for examining the goods market, when the main focus of this thesis is on the labour market, is that the demand for labour is a derived demand, dependent on the demand for goods. Hence, it is necessary to examine the impact of language on the demand for goods so as to understand the demand for labour according to their language skills.

Before starting the analysis of the goods market, let us note, however, that in the theoretical framework now being assembled, it is assumed that there is no interdependence between the utility functions of individuals. Hence individuals make decisions taking into account only their impact on their own consumption and investment. Relaxing this assumption would simply make the analysis more complex, but would provide little additional insight in the role of language in individual decisions.

A perusal of the various microeconomic models of choice in the goods markets leads us to examine two of those as possibly useful in helping us understand the role of language in consumer choices. The first is the characteristics model put forward by Lancaster (1966). In that model individuals are assumed to demand characteristics rather than goods per se, with goods assumed to embody various characteristics. Hence, each good is a bundle of characteristics that is demanded for those characteristics. In such a framework, the language that a good is available in can be seen as a characteristic of that good, so that, for example, identical cans of soup could be considered to differ if their labels were in different languages. If individuals have a preference for using a language and not another, some goods would be demanded by some individuals but not by others.

The second model referred to above is the Z-commodity model, first put forward by Becker (1965). In that model, both goods purchased in the market and time are used by individuals as inputs in the production of Z-commodities, chosen according to the individual's preferences. Since the amount of time used in the production of Z-commodities is partly spent learning how to use the market goods, and since language is one of the most common means of conveying such information, it seems plausible that the time spent by an individual in producing Z-commodities, using a given set of goods, depends in part on the language those goods are available in and on his language skills.

In this analysis of the role of language in the consumption activities of individuals, the Z-commodities framework is used since it is less restric-

tive to assume that individuals put a positive value on time, and that they therefore will prefer to use their mother tongue, the language they are most fluent in, rather than a second language in consumption activities, than to assume that they exhibit a pure preference for their mother tongue. Indeed, in the analysis of the behaviour of the various economic agents, it will be argued that a sufficient condition for them to prefer using their mother tongue rather than a second language is that they are not fully bilingual and simultaneously that their time has a positive market value.

Here it must be pointed out that not only the time loss that results from having to read in a second language the instructions on the use of a good but also the time loss that results from an error happening as the result of using a second language must be taken into account. Errors may mean that the good being used in the production of the Z-commodity is damaged or destroyed or that the Z-commodity cannot be produced or both. In both cases, time must be spent, either to earn anew the price of the input into the Z-commodity or to repeat the production process.

The explicit recognition of the role of language in the production of Z-commodities, a role that results from the fact that language is used to carry information, is not found elsewhere in the literature. Becker (1965) does write, however, that environmental variables such as education can increase the productivity of households by making them better at producing Z-commodities. It could be argued that language is, in this case, a variable analogous to education in that an increase of an individual's fluency will increase the productivity of his time in some of his consumption activities.

The following two hypotheses can be seen as summarizing the role of language in a Z-commodity framework.

- The less they are fluent in language X, the greater the amount of time it will take individuals to use, as an input in the production of Z-commodities, a good that requires, to be used, a given amount of information in language X.

- For given levels of fluency in various languages, individuals will give a greater importance to the language a good is available in, the greater the amount of information required to use that good and the greater the market value of their time.

From the discussion above, it can be summarized that individuals will be willing to pay more for goods available in their mother tongue than for goods available in other languages. What now remains to be defined is the concept of availability in a language. A good will be said to be partly or fully available in a language if the information needed to use that good in the production of Z-commodities is partly or fully accessible to the customer in that language.

Amongst the determinants of accessibility are advertising, used to inform the consumer as to the existence of goods and services, and as to their availability for a given price in a given location at a given time; labelling, used to describe the product, both in terms of its make up and of its possible usage; and operating instructions and warranties, used to indicate to the customer how to use and care for a product. The importance of those various determinants in defining the availability of a good will vary with the nature of the good. For example warranties are more important the greater

the value and the longer the expected life of a good while the importance of operating instructions will be greater the more complex is the use of a good.

Also of importance in determining the availabitily of a good is the language used by salespeople in supplying it to the consumer and the language that after-sales service is available in. Salespeople can be either substitutes or complements to written instructions available in only one language. As complements they play their usual role, but as substitutes they increase the availability of goods in languages other than those of their written instructions. It will be assumed that, since consumers have imperfect memories, the greater the amount of information needed to use a good and the more durable a good, the less likely it is that salespeople can make it available in a language different from those of its written instruction. As to the language of after-sales service, the longer lived a good is, the more important it is in determining the language of availability.

While the discussion carried out above was only for goods, its results generalize to the case of services since the consumption of services is also dependent on an exchange of information between consumers and service-people. Once more, it is plausible that individuals will want to use their mother tongue given that they value their time and are more fluent in that language than in any other. Indeed, in the case of some services, individuals will attach a great weight to being well understood since errors in conversations with doctors, lawyers, and bankers can be very costly.

So, it seems reasonable to assume that individuals prefer to purchase goods and services, private or public, available in their mother tongue (4). The strength of this preference can be measured by how much more they are prepared to pay for goods available in their mother tongue, the M-language, rather than for otherwise similar goods available in a second language, the S-tongue. This differential will be greater the greater the difference in fluency in the two languages, the greater the importance of information in the use of that good, and the greater the market value of the time of the individuals concerned.

In general, if M goods are less expensive than S goods, they will be the only goods purchased by M individuals. If they are the same price, perfectly bilingual M individuals may buy S goods while others would still buy M goods. However, Hocevar (1975) would argue that in such a case M individuals buy M goods; this presumably implies some kind of pure linguistic preference. Finally, if M goods are more expensive, then the decision of each individual depends on the three factors outlined above.

So in a society where individuals are more fluent in their mother tongue than in other languages and where an individual's time has a positive market value, a Z-commodity framework helps explain why individuals prefer purchasing goods available in their mother tongue. This means that it is not necessary to assume that individuals have a pure preference for their mother tongue as a means of communications in order to explain the usual behaviour of consumers in a bilingual society. However, this does not mean that in some cases such a pure preference is not also at work, adding additional strength to the choices resulting from the minimization of time costs.

I.1.3 The Choices of Individuals: the Labour Market

In the case of the choice of employment by individuals, it is assumed that individuals make a choice between leisure and work, given the usual budget constraint and that they want to attain the highest possible level of utility. If employers pay individuals according to the value of their marginal product, individuals must then choose the job where they are the most productive if they want to be on the rightmost budget constraint accessible to them. Such a model of remuneration according to the value of marginal productivity provides, with appropriate caveats, a useful explanation of the economic behaviour of agents in the labour market.

Since individuals are looking for employment that maximizes the value of their marginal productivity, and therefore of their wages, it seems reasonable to assume that they will seek employment where they can work using their mother tongue, the language they are, by assumption, most fluent in. They will make such a choice since the greater their fluency in the language needed to carry out a given task, the smaller the amount of the time needed to carry it out and the lesser the likelihood of mistakes on the job. Of course, the smaller the importance of information flows, the smaller the importance of language in determining the marginal productivity of employees in carrying out a given task. Hence, in some jobs, such as those of labourers, an individual's language skills have little impact on his productivity while in other jobs, such as those of accountants or lawyers, they are quite important in determining his productivity. Indeed, language can be seen as the tool used by individuals to make available on the market some of their abilities; for example, the ability to type, or the ability to read blueprints, is made available to employers through a language. This makes language an important skill to master since, without it, many of the skills an individual is endowed with would not command a return on the market since they would not be available to employers. Such a recognition of the role of language in production activities is not found explicitly in the literature, although reference is often made to the importance of the coordination of production factors (Alchian and Demsetz, 1972).

Since it has been assumed that individuals are more fluent in their mother tongue than in other languages, they will prefer (5) working in that language. It must be shown, however, why a language can be said to be a multi-dimensional characteristic of a given task. Instructions may have to be given or may have to be received, such instructions being either oral or written; hence each task will require various amounts of listening, reading, speaking and writing and is characterized by the amounts required. Hence, the capacity of an individual to carry out a specific task will depend not only on his general fluency in a language but also on his fluency in a specific type of communication. For exemple, labourers must be able to receive oral instructions, that is to listen:accountants must be able to assimilate written material, that is to read.

If individuals cannot find employment in their mother tongue because firms do not have such jobs available, then M-speaking individuals will either take a job in the S-language for which they do have the required non-language human capital, and be paid less than S individuals endowed with the same amount of non-language capital, or they will take a job for which they have, in some sense, more non-language human capital than needed, and be paid the same wage

as S individuals who carry out the same task with less non-language human capital. In the second case, it would mean that M individuals are over-educated or over-experienced for the jobs they hold; such a situation was hypothesized by Hocevar (1975), as a possible outcome of interactions in the labour market of a bilingual economy. In the first case, it would mean that M individuals earn a lower rate of return on their non-language human capital than S individuals. In both cases, differences in marginal productivity, brought about by the lower fluency of M individuals in the S language, rather than discrimination, explain the observed lower earnings or lower level occupations of M individuals. One should be careful, however, not to interpret the results outlined above as saying that M individuals, who work in the S language, necessarily earn less than S individuals. One must be aware that the statements found above with respect to wage differences hold only when individuals are endowed with the same amount of non-language human capital and ability.

So, in a labour market, where individuals are maximizing their utility with the usual income leisure trade-off assumed, and where firms pay individuals according to the value of their marginal product, individuals will prefer working in their mother tongue since they are more productive doing so. However, if individuals can find a job in a second language which, because of demand conditions, allows them to earn more than when working in their mother tongue, they may choose it. But, for a given level of skills associated with a given amount of physical capital, individuals are in general more productive working in the language they master best.

II.1.4 The Language Choice of Firms

This section examines how language affects the behaviour of firms in both the goods and labour market. To facilitate the discussion, a distinction is made between the language of external communications and the language of internal communications. Such a distinction is a natural one to firms, as Morrison (1971) and Breton and Mieszkowski (1975) have shown, and is also a relevant one since the language of external communications is linked to the firm's behaviour on the goods market, while the language of internal communications will determine in part the skills it requires from its employees. The language of external communications is the language of sales, that is the language used by firms to make their products available to the consumer, that is the language of labels, operating instructions, and so on; while the language of internal communications is the language of operations, that is, the language used by the entrepreneur or his delegates to coordinate production. While individuals were assumed to maximize utility through their choice in both goods and labour markets, firms are assumed to maximize profits.

In the following discussion, it is also assumed to simplify matters that the choice of a language of sales and of a language of operations can be separated. Strictly speaking this is not the case since the sales activities of a firm are part of its production activities in the same manner as the work performed on the production line or in the head office. However, sales activities, which include not only sales as such but also activities like billing and distribution, are different from other activities of the firm since they represent the link between the firm and its customers. Hence, the language of sales differs from the language of other operations since it is used for external communications while the language of other activities is

used for internal activities. Such a distinction is probably more valid for consumer goods (individuals use English to buy cars manufactured in Japanese) than for producer goods where the client may often want to interact with the engineer responsible for the production of the good. Finally, it is assumed that producers deal directly with their consumers so as to avoid the need of repeating a similar analysis for each step of the distribution process. The choice of a language of sales, given a language of operations, is discussed first.

In this discussion of the choice of the language of sales, it is assumed that firms are selling their product in an economy, where individuals have either E or F as their mother tongue, with most of them not perfectly bilingual. Firms must then decide if they want to incur the costs of making their goods available in either the E, the F, or both languages. Such a decision presumably depends on the profits (6) to be had from the various choices.

To simplify the discussion let us assume that firm Y along with other firms sells its brand of a product, brand Y, at the market price only in the E language. That firm then decides to review its marketing strategy and to examine if it should also supply the product in the F language using either bilingual labels, or two sets of unilingual labels, or if it should not do so. Since the Y firm will need to incur some costs to make its product available in the F language, it will consider doing so if F individuals are willing to pay more for a product available in the F language than for a product available in the E language. If F individuals value their time at zero and, as assumed earlier, have no pure language preference (7), they will not be willing to pay more for brand Y available in F rather than E and it will not pay the Y firm to make brand Y available in the F language.

Even if F individuals are willing to pay more for F goods than E goods, this does not mean, however, that it pays firm Y to make its product available in the F language. This will depend on the increase in revenues and on the increase in costs of doing so. The increase in revenues will depend on the size of the premium F individuals are willing to pay for brand Y in F. Presumably it is not equal across all F individuals since it depends on their fluency in the E language and on the value of their time. Ceteris paribus, the greater the difference between the price of brand Y in E and brand Y in F, the smaller the number of individuals willing to pay ($P_F - P_E$). Even if F individuals are willing to pay a premium for goods in their mother tongue, this does not mean, however, that they consume the same average amount per capita as E individuals of a given product. This difference in per capita consumption can be the result of differences in tastes which means that, at the same income and price levels, F individuals consume less of a given product than E individuals. It can also be, if the product is not an inferior good, the result of differences in the average income of the E and F groups. However, even if F individuals consume the same quantity of a product as E individuals, it may be that it is not worthwhile making a product available in the F language since F individuals are not sufficiently numerous to permit firms to recoup their incremental costs.

The type of costs that firms must incur to make a product available in the F language depends on the nature of that product. First, the various written documents associated with the product such as labels, instructions, and warranties must be translated. The costs of such translations will depend

on the amount of information, on its nature, more or less technical, on the closeness of the two languages, and on the wages paid to translators. Secondly, engraved products will have to be engraved in both languages, an operation that will take more time than unilingual engravings, or engraved products will be engraved in one or the other language which will lead to more complex inventory controls and distribution procedures. Also, if there is after-sales service, servicemen will have to be hired who can speak the F language or present employees will have to undergo language training. Finally, an advertising campaign will have to be conducted to inform individuals of the availability of brand Y in the F language.

So firms will be assumed to examine the gains and the costs of making their products available in a new language and to choose the profit maximizing solution. Let us note that if the firm has excess capacity when it makes its product available only in the E language, because of indivisibilities, it may find it worthwhile, if it can cover its variable costs, to make its product available in the F language, so as to gain an extra share of the market and reduce its losses, as was first argued by Hocevar (1975). Let us also note that the Y firm may not be willing to offer its product with bilingual labels for fear that E customers may refuse to buy them because they resent bilingual labels; that hypothesis was first offered by Hocevar (1975). If E customers dislike bilingual labels (8), and if distribution and inventory costs make two sets of unilingually labelled goods too costly then F goods may not be offered. So the assumption of profit maximization helps explain why firms make goods available in this or that language. This does not mean that incorrect information may not lead to incorrect language choices, but that the motivation behind language choices is the attainment of the firm's goals.

Turning now to the other language choice of a firm, that of a language of operations, it seems reasonable to retain the assumption of profit maximization. In this discussion, it will be assumed that the level of output is fixed and that firms attempt to minimize the cost of producing that output. It is also assumed that the language of sales has already been selected and that what is being chosen is the language of internal communications. Finally, it is assumed that all types of labour are available from both language groups in the community, once more referred to as E and F, and that the supply curves for a given type of labour are the same for workers from each group.

Given the above, let us assume that an E capitalist decides to open a new firm: he must then choose a language of operations and must weigh various considerations. First, he is more productive when working in his mother tongue E than when working in the F language (9), a fact that will lead him to prefer that workers he interacts with be able to carry out their tasks in the E language. Since it is assumed that individuals are more fluent in their mother tongue than in a second language, it is likely that most workers he will hire will be of the E language group. Hence, time savings for the owner will lead him to choose as employees individuals who speak his mother tongue. It could be argued, however, that this preference applies only to those employees who directly report to the owner, since he has no reason to interact with others. While this is correct, it seems plausible that the owner will want to insure that he could, if necessary, exchange information with lower-level employees so that a knowledge of E may also be required of them. Hence, a greater degree of fluency in the E language would be required of those working a greater amount of time in contact, orally or in writing, with the owner than

of those further removed from contact with him, but a minumum degree of fluency would still be required of them, so that written documents are in E and instructions in that language are understood,

While the greater productivity of an owner in his mother tongue will lead him to prefer it, ceteris paribus, as the language of operations in his firm, a second consideration is the language that machines and other pieces of production equipment are available in. This language, which is defined by such things as the language of operating instructions, maintenance instructions, and repair instructions, will be referred to as the language of technology. Owners are assumed to, because of time savings and greater comprehension, prefer using their mother tongue, rather than a second language, as the language of technology in their plants. If they can do so, then the choice of the E language by E owners as the language of operations is again justified. If owners choose a technology available in a language other than their mother tongue, say G, then they may choose to require a knowledge of G or of G and E from production workers, the level of fluency required in either languages depending on the exact importance of information flows between workers and owners and on the amount of information needed by workers to operate production equipment. This may lead to different language requirements in various occupations and in particular to different requirements for employees working in the plant where the language of technology may dictate the language requirements and for employees working in the office where the language of the owner may, because of the importance of information flows, dictate the language requirements. It may also lead to different language requirements across industries since the importance of production equipment, and therefore of the language of technology, varies across industries. It is probably less important in labour intensive sectors, such as Services and Government and more important in the more capital intensive sectors such as Manufacturing and Transportation.

A third and final consideration is the importance of the markets outside the bilingual region for the firm. If a firm, or part of a firm, is located in a bilingual region but sells its goods and services, through arm's length transaction or not, to individuals, firms, or other parts of the firm that are located say in a E region, then that firm is more likely to require a knowledge of E from its employees; such a point was made by Breton and Mieszkowski (1975). For example, if the head office of a firm is located in a bilingual E and F region, but the greater part of its production activities are located in a E only region, then it is quite possible that E will be the working language. Similarly, if a firm's activities are all located in the bilingual area but its markets are mainly in E areas, then knowing E will, ceteris paribus, increase the earnings of some employees of that firm since they can deal with both foreign and local customers.

The arguments put forward above indicate that productivity considerations, which depend on information flows, may lead employers to prefer a particular language for all or part of a firm's operations. This preference for a language and not for members of an ethnic group may nevertheless lead to members of one ethnic group, that which has as its mother tongue the language of operations of the firm, having a greater access to employment opportunities than members of other language groups because of their greater fluency in that language. Indeed, it can be said that not only will they have greater employment opportunities but that in that case E individuals will have a greater access

to top jobs in the firm. This is an interesting result since it means that preferential hiring of members of one's language group can be explained without assuming that the entrepreneur practices discrimination (Raynauld et Marion, 1972), or even that he practices screening (Arrow, 1972), using ethnicity as a screen (Migué, 1970). Such a result was implicit in Keyfitz's work (1963) but has not since been followed up.

This concludes the discussion of the role of language in explaining the choices of individuals and firms in a bilingual economy. Before going on to discuss their interaction in a market framework, it is appropriate to bring up two points. First, the role of government per se was not discussed above. With respect to its behaviour as a provider of goods and services and with respect to its behaviour in the labour market, it is assumed to act like a private firm. As to its linguistic make up, it wil depend on the political system of the society discussed. In a western style democracy, such as Canada or Belgium, the various levels of government can be assumed to be staffed by the linguistic group that represents a majority of the voters.

The second point is that some individuals may not choose to use their mother tongue in the production of Z-commodities or in the workplace. Such behaviour will occur if individuals have chosen to invest in a new language, learning it in the workplace or through consumption activities. Presumably, individuals find that the lower wages they may have to accept to be able to carry out this type of investment in the workplace is the cheapest possible way for them to make that investment. It is unlikely, at a given point in time, that a great number of individuals are making that kind of investment.

It is now time to turn to a discussion of the interaction of the language choice of individuals and firms. This discussion will be carried out only for the labour market. The goods market is left aside since the goal of this thesis is to explain differences in earnings between language groups rather than differences in the price and availability of goods. Since the demand for labour is, as pointed out earlier, a derived demand, the links between the goods and labour markets will be implicitly taken into account in the discussion that follows.

II.1.5 The Labour Market of a Bilingual Economy

The goal of this discussion is to derive in a competitive labour market the impact, positive or negative, on earnings of the various combinations of language skills of a given individual. To do so, the labour supply and labour demand conditions must first be defined since differences in these conditions will lead to different results. In this discussion of an economy, where E and F are the language groups, it will be assumed that all consumers and workers are member of the F language group while all firm owners are members of the E language group. Furthermore, both the language of technology and the language of the external marketplace is E. Finally, the F individuals will be assumed not to be able to earn as much as they do now, should they leave their region of residence. One possible explanation of this fact is that the surrounding regions offer employment and goods and services only in the E language. These are strong assumptions but they are useful in establishing the main results in the labour market and they will be examined afterwards one by one.

Since consumers are of the F language group, most goods are likely to be

available in the F language. Furthermore, those salespeople who can speak the F language, rather than say the E language, will see their services sought by most consumers and should therefore earn more than unilingual E salespersons. If some of the consumers are assumed to be of the E language group, then the relative value of knowing E or F for the salespersons will, since individuals prefer shopping in their mother tongue, depend on the purchasing patterns of both groups. Presumably, a salesperson will sell more of a given product to that group which has, if the product is a normal good, the higher income, given that both groups have the same preferences (10). In such a setting, bilingual salespeople would be expected to earn more than unilingual salespeople, since they can serve more customers of both groups rather than having to turn down sales opportunities because of an inability to communicate with the consumer.

In the labour market the assumptions of immobility of the F labour, of the presence of only E firm owners, and of the E language as the language of technology and of the international marketplace mean that all F workers will need to know some E to hold a job, their fluency depending on their type of employment. As argued above, the closer individuals work with the capitalist, the greater the required degree of fluency in the E language. Hence, managers and engineers will be required to know E better than clerks who must know it better than production workers whose contacts with the owners are probably quite minimal. On the other hand, production workers who are more fluent in the language than their colleagues will need less time than them to master the particular amount of information needed to perform their jobs.

If one relaxes the assumption that all firm owners are E individuals, then the F capitalists, assumed to be a minority, will offer employment in the F language. It seems plausible that those F employees who are the least fluent in the E language will be the first to seek those jobs since they are the ones whose productivity increases the most because of such a change, a fact which whould mean higher wages. But if the language of technology and of the international marketplace remains E then F owners will not be, on average, as efficient as their E counterparts in using technology and in finding foreign markets. Hence their employees will work with less efficient capitalists than before, a fact that makes for lower productivity: still their wages could easily be higher than those they were paid when they worked in the E language. Hence, the presence of F entrepreneurs means that it will no longer be necessary for all employees to be bilingual because of their employers' preference. However, it may well be that the role of the E language as the language of the international marketplace and as the language of work in F firms will result in bilingual F employees earning more, ceteris paribus, than unilingual F employees in F owned firms since they are a key link with consumers and since they are more mobile, being able to go to work for E firms in the region.

Reinstating the assumption that all owners are of the E group, what happens if a small part of the workforce is now assumed to be of the E language group? At the same level of ability and non-language human capital, E individuals will be expected to earn relatively more than their F counterparts since they communicate better in the E language. The greater the numbers of well educated E individuals, the greater their share of top-level jobs in the economy since E owners can more readily find amongst them the employees they need at a competitive wage. As for production workers, E individuals can be expected to work with pieces of equipement that require a greater amount of information to operate than F individuals. Indeed, if F individuals master E

in such a manner that the information needed to operate some machines must be translated before they can use them, then they will usually work with equipment which is, on average, older than that available to E individuals, since translation takes time.

If entrepreneurs and workers of both language groups are assumed to be present in the labour market, then it is likely that workers who hardly speak a second language will work for entrepreneurs of their own group while bilingual individuals will be found working for both kinds of entrepreneur; bilingual workers should then, ceteris paribus, earn more than unilingual workers since the former are more mobile within the region.

Up to now, it has been assumed that all F workers could speak some E. If one removes that assumption, one is hard-pressed to explain why E entrepreneurs do not import E labour to replace F workers rather than offer a bilingual work environment. One reason could be that the cost of attracting E workers to the region is higher than the cost of offering a somewhat bilingual workplace. Another reason could be that F workers, who cannot find in another region the opportunity of living in the F language, agree to accept sufficiently low wages so as to make it worthwhile for E entrepreneurs to create a bilingual working environment rather than to import E workers or to leave. How much lower the wages of the F unilingual workers must be will depend on the costs of operating a bilingual firm and on the possibility of operating abroad in a E only environment. If the bilingual economy is endowed with unique natural resources, the wages of unilingual F workers may not be much lower than if they agreed to work in the E language since firms cannot relocate elsewhere.

Another possibility in a labour market such as the one described above is that, since F individuals are more productive when they can work in the F language than in the E language (their second language), it pays the owner to himself learn the F language or at least to hire bilingual managers and to make technology available in the F language if his increased costs are covered by his share of the increased productivity of his workers.

It is now time to summarize the results of the discussion of the role of language seen from a human capital point of view in the preceding discussion by the following hypotheses.

The general hypothesis is formulated for all workers and says that: In a bilingual economy, bilingual individuals can be expected, ceteris paribus, to earn more than unilingual individuals since they have a greater choice of employment available to them. This general hypothesis can be further refined into more specific hypotheses.

- In a bilingual economy, the importance of both language groups in terms of their purchasing power and patterns will influence the relative earnings of unilingual and bilingual employees particularly in the Trade sector. However, bilingual employees are expected to earn more than unilingual ones since they have a bigger pool of customers which grows the greater their degree of fluency in the second language.

- In a bilingual economy, those who speak best the mother tongue of the owners of firms will have greater access to better jobs and will, ceteris paribus, earn more than individuals who are less fluent in that language, who find themselves in lower level jobs.

- In a bilingual economy, production workers who best master the language of technology can be expected to earn more than other workers.

- In a bilingual economy, those who speak the language of the majority are more likely to work for the government since it is likely to operate in that language.

II.2 The Determination of Individual Earnings

Language as human capital is not, however, the only factor that explains the earnings of an individual. The role of language as an ethnic characteristic must also be explained as well as the role of other types of human capital, such as education and experience. This is done in this part of Chapter II where a more complete framework of earnings determination is presented, in which the results outlined above are integrated.

In the first part of this chapter it was shown how language could be viewed as a form of human capital, used by individuals to exchange information with one another and how the possession of a given language could bring different rewards in different labour markets. However, as the review of the literature carried out in Chapter I showed, language is not the only individual characteristic, be it of a human capital or ethnic nature, that can have a positive or negative impact on the earnings of an individual. Since one of the goals of this thesis is to develop a theoretical framework that can be used to guide attempts at empirically measuring and interpreting the link between language and earnings, other factors that can influence the earnings of an individual must be accounted for. If this was not done the true impact of language on earnings could not be calculated and the impact ascribed to language through empirical estimations could easily be an under or (more likely) an overestimate of the true impact of language knowledge on earnings.

Once it has been accepted that a reasonably complete framework of the earnings determination process for individuals must be presented it remains to be decided how such a framework will be put together. One solution would be to derive the proof that this or that characteristic is important in explaining the earnings of individuals. Given the existence of many models showing that a link can be formally established between earnings, and say education or experience, that approach would be a waste of time for both the author and the readers of this thesis. Hence the following approach has been chosen: first, the various characteristics retained in this study are outlined; then the role of each in explaining earnings in a bilingual economy is discussed.

As Taubman has stated "... a person's marginal productivity depends on a variety of skills and attributes" (Taubman, 1976, p. 448). As to the earnings of an individual they depend not only on his productivity but also on the overall supply of and demand for the characteristics he is endowed with (Hartog, 1976). In this discussion, it will be assumed that, at a point in time in a competitive labour market, there exists an overall supply of individuals willing to work, each of them endowed with a given set of characteristics, and an overall demand for labour. The individual characteristics that have been shown in past studies to be of relevance when explaining individual earnings are:

- ethnicity, often associated with race (Becker, 1957);

- education, the level of which is a result of both minimum schooling laws and individual choices and which is often measured by the number of years of schooling (Mincer, 1974);

- experience, an approximation of the amount of both general and specific human capital acquired through on-the-job training, usually measured by the number of years worked (Mincer, 1974);

- intelligence, the result of the interaction of nature and nurture, the level of which is often measured by I.Q. tests (Taubman, 1976).

These four individual characteristics are not the only variables found in empirical work on individual earnings nor are they always found in each and every study. Other variables are often included such as urban residence, occupation, or industry to attempt to take into account market forces that otherwise would bias the coefficients of individual characteristics. On the other hand, ethnicity is not usually included when an ethnically homogeneous group of workers is being examined since it would be theoretically meaningless to do so. As to intelligence, data limitations often preclude its inclusion although its role is clearly recognized on the theoretical level. Nevertheless, the four characteristics outlined above can be seen as the traditional pillars of a human capital type approach (Blaug, 1976) to explaining earnings in an ethnically disparate society, and they will be, except for intelligence, included in the framework used in this thesis.

Their specific role in common models of earnings determination and the appropriate modification that must be made to take into account the fact that language is a general form of human capital that can be seen as possibly interacting with other types of human capital are now discussed.

Ethnicity is the first of the four personal characteristics to be examined. Its impact on earnings is usually studied with reference being made to various models of discrimination that can be divided, as discussed in Chapter I, into two groups; true discrimination models (Becker, 1957) (Krueger, 1962) (Alexis, 1975) and statistical discrimination models (Arrow, 1972) (Aigner and Cain, 1976). In the first case discrimination is the result of an explicit decision of employers to discriminate while in the second ethnicity, usually race since most models have been developed for the American economy, is used as a measure of expected productivity.

Studies conducted in the United States have shown that, in that case, race explains part of the differences observed between the earnings of blacks and whites (Smith and Welch, 1977) (Weiss, 1970) (Strauss and Horvath, 1976). However, the fact that ethnicity proved significant in explaining earnings in the United States does not necessarily mean that ethnicity plays the same role in other labour markets.

The main difference between ethnicity and education or experience is that ethnicity is a given for the individual while his education and his experience can be changed by him. As a result, the impact of ethnicity on an individual's earnings is the result of demand factors since its supply is a given for him. Hence, it may increase or decrease his earnings depending on the demand patterns of firms for individuals who are similar save for their ethnicity. In the case of education or experience, however, both supply and demand factors come into play. Individuals decide what level of education they each want to

be endowed with; they then offer it with all other individuals on the labour market and the relative level of supply, given a demand by firms, determines its returns. That demand is once more the result of the firms' choices.

In a labour market where the main source of ethnic differences between individuals is their mother tongue, it is more difficult to measure the impact of ethnicity on their earnings than if their ethnicity was determined by the colour of their skin since their mother tongue is also part of their human capital. It is, therefore, impossible to sort out in a world of unilingual individuals the returns to their linguistic human capital and the returns to their ethnicity. It is feasible to examine, however, the relative value of knowing a second language by examining, ceteris paribus, the earnings of unilingual and bilingual individuals of the same mother tongue. It will also be feasible to examine the relative value of belonging to one ethnic group or another by comparing, ceteris paribus, the earnings of bilingual individuals from both ethnic groups since they have the same linguistic capital, if they are equally fluent in their respective mother tongue and second language.

If differences in the returns to the two languages of a bilingual economy are found, the theoretical framework put together in the first part of this chapter should help throw some light on their causes. If differences in the returns to ethnicity are found, the various discrimination models and the hypothesis of differing information networks (Migué, 1970) will be used to look at the results.

In the case of education, it has been shown that an increase in education normally leads to an increase in the real income of individuals (Becker, 1964); since the acquisition of education involves the expenditure of both time and money by individuals, it is a plausible result. Going one step further, empirical studies have shown that more education for an individual usually leads, ceteris paribus, to an increase in his earnings with the possible exception of some post graduate studies (Weiss, 1970), (Mincer, 1974), (Carliner, 1976).

While individuals expect higher real income as a return to increased education, they will earn more only if a firm is willing to pay them more than before they acquired more education. Firms may be willing to do so because they are actually more productive than before (Becker, 1964) or simply because firms use education as a screening mechanism (Spence, 1974); whatever the reason, empirical studies find that education has a positive impact on earnings. As indicated above, such a positive impact has been found in various studies none of which, however, has examined the role of language in explaining the returns to education. If more education gives access to jobs where information becomes more important in accomplishing the required tasks, then it is possible that the returns to bilingualism increase with education. Hence it will be useful in an empirical examination of the returns to bilingualism in a labour market to examine if such interactions occur.

The experience variable is included to take into account that individuals usually acquire on-the-job training human capital of both a general and specific nature (Becker, 1964). Since it has been shown that a positive relation should exist between human capital and earnings (Becker, 1964), and that the more experience one has, the more on-the-job training one has acquired, a positive and concave relation is assumed between experience and earnings for the first part of the experience-earnings profile. However, because of the increasing obsolescence of human capital as individuals grow older and because

of the reluctance of individuals to engage in new investments since they have less and less time to recoup their costs, it seems plausible that in the last part of the experience-earnings profile the relationship should be negative. Overall, the relationship will be positive except perhaps in its last portion and concave.

Empirical studies have shown that there is a positive and concave relationship between earnings and experience be it measured by age (Weiss, 1970) or, perhaps more correctly, by age minus years of schooling minus six (Mincer, 1974). Given the measure of experience used, it may be that the declining part of the experience-earnings profile is caused in part by the declining strength and poorer health of older individuals (Blaug, 1976).

As in the case of education it seems possible that human capital acquired through job experience and made available to employers through language may be more or less valuable depending on the language known by an individual in a bilingual economy. Hence, not only will experience, that is age corrected for length of schooling, and experience squared be included in the model but it will also be necessary to examine if there exists some interaction between language and experience.

In the case of intelligence, it has also been shown that there exists a positive relationship between intelligence and earnings (Taubman, 1976). Indeed empirical studies (Hause, 1972) (Wolf and Van Slijpe, 1973) have shown the significance of such a link and the consequences of omitting intelligence from earnings models: the usual impact is to increase the value of the schooling coefficients (Behram and Taubman, 1976). In the empirical analysis carried out further, it will be impossible to account for intelligence because of data limitations; but the considerations pointed out above will be kept in mind.

To conclude, it has been argued that language is always a form of human capital and in the case of one's mother tongue is also an ethnic attribute. In a bilingual labour market both the human capital aspect and the ethnic aspect of language can have an impact on an individual's earnings, with the impact depending on the supply of and demand for labour of the two language groups. The impact of language on earnings must be, however, examined within a more complete model of earnings determination so as to correctly measure and interpret it.

REFERENCES

(1) This definition differs from the definition used in the Canadian Census; the ethnic group of the first paternal ancestor to reach North America defines the ethnicity of the individual.

(2) If only one language is known, it is more likely to be the individual's mother tongue if it is used at play and at school by the child than if another language is used for one or both of these activities.

(3) This is especially plausible in the case of societies where the various languages can be used in social interactions, at school, and at work; witness the case of English and French in Quebec. However, in societies where the minority language is seldom used outside the home, individuals may choose to use their second language for activities outside the home because they are more fluent in it.

(4) An exception may be menus in "authentic" foreign cuisine restaurants.

(5) It is assumed in this discussion that, as in the case of consumption choices, individuals have no pure preference for working in their own language; should they have a non-pecuniary preference, then they would *a fortiori* prefer working in their mother tongue.

(6) This holds if firms maximize profits, as assumed above, and not, for example, sales.

(7) A third possibility, that where all F individuals are fully bilingual, has already been ruled out above.

(8) Should they like bilingual labels, then they may absorb part of the cost.

(9) Under the usual assumption about the fluency of an individual in his mother tongue and in a second language.

(10) And given the respective size of both groups.

CHAPTER III

THE QUEBEC LABOUR MARKET

Quebec was chosen as the appropriate labour market to use in attempting to examine some of the hypotheses of the theoretical framework put forward in Chapter II for three reasons. First, it is a bilingual labour market where there are differences in the mean level of earnings of the two language groups. Secondly, the author is familiar with the various institutions found in that market and with the data available to study differences in earnings. Finally, it has been studied before as the review of literature of Chapter I showed, but the explanations put forward were felt to be not very satisfactory.

In the first part of this chapter, the detabase used in this thesis will be described. That done, the differences in the mean level of earnings of the two main language groups in Quebec will be examined in the second part of the chapter. This is done to show that there is prima facie evidence that language could explain earnings in the Quebec labour market and to establish reference points to which the net impacts of language on earnings, calculated in Chapter IV, can be compared. In the third part of the chapter the evidence with respect to four of the most important factors in determining the relative value of two languages in a bilingual market is reviewed in the case of Quebec. These factors whose importance was emphasized in Chapter II are the demographic weights of both groups, the mother tongue of owners of firms, the language of technology, and the language of the external marketplace. In the fourth and final part of the chapter, the evidence with respect to the use of English and French is reviewed in the light of the factors examined in the third part.

III.1 The Database

In 1971, the population of Quebec numbered more than six million: 2.1 were gainfully employed in 1971 at the time of the Census. Since the theoretical framework developed in Chapter II was designed to explain individual earnings, it would be best if a test of its validity could be conducted for each employed adult in Quebec. This is not feasible since no data is available on the earnings of each individual in Quebec. What is available, however, is a one-in-one-hundred sample of the Quebec population, drawn from the 1971

Census of Canada. This database is one of the few that contains information recorded by individual for the province of Quebec and it is the most adequate one to use because of the information on various linguistic characteristics found in it.

The 1971 Census of Canada was carried out in the first week of June 1971, mainly through a self-enumeration technique. Two-thirds of the population had to answer a short questionnaire (Form 2A, ten questions), and one-third of the population a long questionnaire (Form 2B, forty questions). It was from that last third of the population that Statistics-Canada drew a one-in-one-hundred sample of the whole population of nine of the ten provinces of Canada, Prince Edward Island, Yukon, and the Territories being excluded. In addition, separate samples were drawn from Montreal and Toronto. Those samples were then made available to researchers through the Public Use Sample Tapes, PUST for short. For the whole of Quebec the sample comprises 60,280 individuals, while for Montreal it is made up of 27,433 observations. Those two samples were stratified by sex, age and mother tongue so that the proportion of individuals with English, French, or another language as their mother tongue is the same in the sample as in the whole population.

Not all individuals found on the Quebec and Montreal sample tapes have been used in this analysis. Only 9,869 individuals are used for calculations performed for the whole of Quebec; for Montreal the number is 4,638. It is, therefore, useful to describe and justify the various grounds for exclusion that explain the differences between the number of individuals on the sample tapes and the number of individuals used in the analysis.

The most sweeping exclusion is that of women, which reduces the number of individuals by half. The reason for their exclusion is that, given the information available in the database, it is not as easy to model correctly the process of earnings determination for women as it is for men since the measure of experience (Mincer, 1974) used in this study is obtained from calculations using the age and schooling level of individuals. Such a procedure implicitly assumes no interruption of labour force participation by the individual. While this may be a reasonable assumption for men, it is not a reasonable assumption for women who, if they are married and more so if they have children, can be expected to have interrupted their participation in the labour force at some point in their life (Mincer and Polacheck, 1974). No information is available, however, on the length of such an interruption, if any, so it was decided to exclude women from the analysis.

The second exclusion is that of individuals who are neither Anglophones nor Francophones. Two reasons explain their exclusion. First the theoretical framework of Chapter II was developed for a bilingual labour market, that is two mother tongues and two languages used, not for a multilingual labour market. The second and more binding reason is that the sample size would not permit a detailed analysis of the earnings of individuals whose mother tongue is neither English nor French since they made up less than eight percent of males aged more than fifteen in Quebec in 1971 (1).

The third exclusion is that of non-whites, that is individuals of African, Asiatic, or Indian origin. The reason for their exclusion is that, because of their small numbers, it would be impossible in the analysis to take into account their race. Their inclusion, therefore, could lead to biases in the analysis since race has been shown, at least in the United States, to have an

impact on earnings (Weiss, 1970); hence, it was decided to exclude non-whites from the analysis.

Individuals are also excluded if they had no declared positive earnings in 1970, if their major source of income was not wages and salaries in 1970, if they were not wage earners at the time of the Census, or if they immigrated to Canada in 1970 or 1971. These exclusions are made to ensure that the analysis looks at individuals whose main source of income in 1970 was wages and salaries and not self-employment income or transfer payments (2). As a result of excluding individuals without declared positive earnings, all individuals aged less than fifteen are excluded since Statistics Canada assigned them zero earnings on the Public Use Sample Tapes. As to newcomers, they are excluded so as to insure that the earnings analysed were earned in Quebec so that estimated rates of returns, say to education or experience, are calculated for the Quebec market (3).

Finally, as Tables 3.1 and 3.2 indicate, individuals working in specific industries or occupations are excluded from the final sample. The specific industry and occupation groupings found in Tables 3.1 and 3.2 are the only ones available on the Public Use Sample Tapes: no more detailed break-downs are available.

Table 3.1

Industry Groupings on the Public Use Sample Tape, Included and Excluded from the Final Sample.

Industry Groups	Division	Included
Agriculture	1	No
Forestry*	2	Yes
Fishing and Trapping	3	No
Mines, Quarries,* and Oil Wells	4	Yes
Manufacturing	5	Yes
Construction	6	Yes
Transportation, Communication, Other utilities	7	Yes
Trade	8	Yes
Finance, Insurance, Real Estate	9	Yes
Community, Business, and Personal Services	10	Yes
Public Administration and Defense	11	Yes
Industry not Determined	12	No
Not Applicable	-	No

Source: Public Use Sample Tape, User Documentation, p. 6.2.40.

Note: The Division numbers correspond to those found in the 1971 Standard Industrial Classification Manual, Ottawa, Statistics Canada, 1971, (12-501).

* Individuals working in those industries are included when the whole of Quebec is studied but not when only the Montreal area is studied.

Table 3.2

Occupation Groupings on the Public Use Sample Tape, Included and Excluded from the Final Sample

Occupation	Major Group	Included
Managerial and Administrative	11	Yes
Sciences and Engineering	21	Yes
Social Science	23	Yes
Religion	25	No
Teaching	27	Yes
Medecine and Health	31	Yes
Artistic and Literary	33	No
Clerical	41	Yes
Sales	51	Yes
Services	61	Yes
Farming and Horticultural	71	No
Other Primary	73,75,77	Yes
Processing	81,82	Yes
Machining, Assembling, Refining	83,85	Yes
Contruction Trades	87	Yes
Transport Equipment Operating	91	Yes
Other Occupations	93,95,99	No
Not Stated	0	No
Not Applicable	-	No

Source: Public Use Sample Tape, User Documentation, p. 6.2.41

Note: The Major Group numbers correspond to those found in the Occupation Classification Manual, Census of Canada 1971, Volume I, Ottawa, Statistics Canada, 1971, (12-536).

The reasons for excluding those specific industries and occupations are varied. Agriculture and Fishing and Trapping are excluded since the earnings of individuals in those sectors are highly dependent on nature, a factor whose influence is very hard to isolate and control for in this analysis since no information is available on the Public Use Sample Tape on the quality of land that a farmer owns or on the location of a trapper's lines. The Industry Not Determined group is excluded since ownership of that industry, a characteristic used later on for analysis, cannot be established. As to individuals in the Not Applicable group they are either under 15 years of age or did not work in 1970; therefore, they had no positive earnings, a reason already cited as grounds for exclusion. Occupations in Religion are excluded because of the highly specialized nature of the education, because of the nature of the remuneration system, and because individuals in that occupation may take poverty vows. Artistic and Literary Occupations are excluded because of the impossibility, given the information in the database, of measuring the relevant human capital, talent. Farming Occupations are excluded for the same reason that lead to the exclusion of the Agricultural sector. Individuals in Other

Occupations and Occupations Not Stated are excluded since it is impossible, for example, to assess the use of language in those occupations. Finally, individual in the Not Applicable category have already been removed when individuals with non-positive earnings were excluded from the analysis.

The various exclusions described above are defined in terms of the variables and codes found on the Public Use Sample Tape in Appendix B. The final sample that results from those exclusions is 9,869 males in the whole of Quebec and 4,638 in the Montreal area. That sample is described in detail in Appendix C where tables give the breakdown by Anglophones, bilingual or not, and Francophones, bilingual or not, on the one hand, and various socio-economic characteristics on the other. These characteristics are, for both the whole of Quebec and for Montreal: Occupation, Industry, Education, Age, and number of Weeks Worked. Only for the whole of Quebec is a breakdown by Regions included.

To summarize, the individuals found in the sample used in this thesis are Caucasian males who, in 1970, worked mainly for wages and salaries in selected industries and occupations, were either Anglophones or Francophones, and were residents of Quebec in 1971. They are classified as Anglophones or Francophones according to their mother tongue, that is the first language they learned, and as bilingual if they can carry out a conversation in English if they are Francophones and vice versa. Finally their earnings include only their wages and salaries and exclude self-employment income (4).

III.2 The Quebec Labour Market in 1970: Makeup and Differences in Earnings.

The breakdown by language groups of the relevant part of the Quebec population is first examined with the help of Table 3.3.

Table 3.3

Male population of Quebec and Montreal, fifteen years and over, classified according to Mother Tongue, 1971.

Language group	Quebec Numbers	%	Montreal Numbers	%
Anglophone	276,360	13,3	206,485	21,5
Francophone	1,659,845	79,6	624,195	64,8
Other Mother Tongue	148,180	7,1	131,885	13,7

Source: 1971 Census of Canada, Volume 1, Part 4 (Bulletin 1.4-5), Tables 11 and 12, Statistics-Canada (#92-733).

Table 3.3 shows that Anglophones and Francophones form the majority of male wage earners on the Quebec labour market and that the relative importance of both groups differs between the Montreal region and the whole of Quebec. To examine bilingualism by mother tongue for males aged fifteen years and over. The results are found in Table 3.4.

Table 3.4

Estimated Proportion of Males, Quebec and Montreal, fifteen years and over, classified according to Mother Tongue and Bilingualism, 1971

Language Group	Percentage Quebec	Montreal	Language Group	Percentage Quebec	Montreal
Unilingual Anglophone	47,2	52,6	Unilingual Francophone	51,1	31,8
Bilingual Anglophone	52,8	47,4	Bilingual Francophone	48,9	68,2

Source: Calculations made from the 1/100 sample, Printouts T 11 and T 61.

Does language matter, however, in the determination of earnings? Table 3.5 shows that there is *prima facie* evidence to that effect for the whole of Quebec.

Table 3.5

Mean Earnings of Males, fifteen years and over, classified according to Mother Tongue and Bilingualism, Quebec, 1970

Language Groups	Mean Earnings (in dollars)	Percentage with respect to earnings of all Males	Percentage with respect to earnings of Unilingual Francophones
Anglophone:	8,551	1,32	1,64
Unilingual	8,776	1,35	1,69
Bilingual	8,350	1,29	1,61
Francophone:	6,150	,95	1,18
Unilingual	5,198	,80	1,00
Bilingual	7,146	1,10	1,37
All Males	6,497	1,00	1,25

Source: Calculations made from the 1/100 sample, Printout T 16.

From the evidence found in Table 3.5, it can be seen that, in terms of gross earnings, there are three distinct groups in the Quebec labour market. At one end one finds the unilingual Francophones, at the other end the Anglophones, unilingual or bilingual, and in between the bilingual Francophones. These gross differences suggest that English may be a more valuable language than French in the Quebec labour market. However, it could easily be that the differences in earnings observed in Table 3.5 are explained by such things as differences in the level of education, in the age structure, or in the work effort of the members of the different language groups. Hence, from the evidence on gross earnings differentials found in Table 3.5, one cannot conclude that language explains differences in earnings. However, the evidence presented in Tables A-1 to A-4, found in Appendix A, lends more support to the

idea that language may explain some part of the differences observed in Table 3.5. To facilitate the analysis, the results of Tables A-1 to A-4 on gross earnings differentials between language groups are used to calculate the relative differentials between unilingual Francophones on one hand and bilingual Francophones, unilingual Anglophones, and bilingual Anglophones on the other. Those results are presented in Tables A-5 to A-8.

That set of tables shows that, for the schemes of classification used, systematic and substantial differences can be found between the earnings of Anglophones and Francophones in the Quebec labour market. Explanations of these differences must await Chapter IV where a multivariate analysis will be carried out. For now it is appropriate to point out a few salient facts and to suggest several hypotheses that could be useful in explaining the observed gross differences. These hypotheses, which are obtained in part from the theoretical framework of Chapter II cannot be verified by examining gross differentials; such a verification must await the analysis of the net differentials presented in Chapter IV.

Looking first at differences in earnings when individuals are classified by occupations, one finds that it is in the occupation entitled Administration, that is mainly managers, that the relative difference in earnings between unilingual Francophones and Anglophones is the greatest. A naïve explanation suggested by the theoretical framework of Chapter II is that firm owners are often Anglophones and that they prefer working in English with those closest to them. The ownership of firms in Quebec will be examined later on (5) so as to permit, if possible, an analysis of that hypothesis.

One also finds that, leaving aside the Administration group, bilingualism pays more in the Sales occupation than in any other occupation. One possible explanation is that bilingualism is necessary for salespeople if they want to be able to serve the whole population of Quebec. Hence, it would not be surprising if, in such a consumer-oriented occupation, bilingualism paid more than unilingualism in either language.

Looking at differences in earnings when individuals are classified by industries, one finds that the gap between Anglophones and unilingual Francophones is greater in those sectors where anglophone ownership is greater (6), that is Manufacturing, Transportation and Communications, and Finance; indeed in those sectors unilingual Anglophones earn more than bilingual Anglophones. One possible explanation is that, as argued in Chapter II, anglophone owners hire Anglophones for the white-collar jobs. Another explanation is that the activities in Quebec of those sectors depend heavily on the external marketplace, which is mainly English-speaking.

One also finds that in the Trade sector bilingual individuals earn more than their unilingual counterparts. This is compatible with the hypothesis that in consumer oriented industries and occupations, bilingualism is an asset that enables its holder to serve the entire population.

Looking at differences in earning when individuals are classified by education groups, one finds that the value of knowing English with respect to knowing only French increases as individuals acquire more high school education but is lower for university graduates than for individuals with a grade twelve or thirteen education. These increasing gross returns to the knowledge of English agrees somewhat with the hypothesis that language skills and education are complementary types of human capital. As to the decrease in the

differences in gross earnings between unilingual Francophones and the other three groups that is observed when one moves from the 12-13 to the Some University category, one possible explanation could be that Francophones with university training prefer working (7) in the public sector of Quebec, that is the provincial government, school boards, and health institutions, where French is the language of work. Indeed, according to a study done by METREQ using data from the Highly Qualified Manpower Survey of 1973, 61,5 per cent of the Francophones of Quebec who hold at least one university degree work in the public sector of Quebec while only 39,1 per cent of the Anglophones residing in Quebec do so (METREQ, 1977).

It is also interesting to note that bilingual Anglophones earn more than unilingual Anglophones when they have a primary education or less; but when they have a grade eleven education or more, they earn more if they are unilingual. This could result from anglophone firm owners hiring bilingual Anglophones to act as an interface with unilingual Francophones workers, leading to a concentration of bilingual Anglophones in middle-level jobs.

Finally, looking at differences in earnings when individuals are classified according to age, one finds that the value of knowing English first increases then decreases with age in the population cross-section. It is impossible, however, to know if this pattern holds for each cohort in the population or if vintage effects are being observed.

An analysis similar to the one carried out above could be made for the Montreal area. Substantial differences in earnings between language groups would be found and, overall, the patterns outlined above would also hold. Hence it was decided not to repeat the analysis: however, the appropriate tables are found in Appendix A. Once more, it is important to emphasize that the gross earnings differences outlined above are merely descriptive and should not serve as a basis for direct inference of the impact that language has on earnings. In the following part of this chapter, the Quebec labour market is described in more detail so that formal tests of the relationship between language and earnings can be made in later chapters.

III.3 The Factors Influencing the Returns to English and French in Quebec in 1970

As pointed out at the beginning of this chapter, it was argued in Chapter II that at least four factors have an impact on the returns to an individual's linguistic skills in a bilingual labour market. It is, therefore, useful to examine at least these four factors so as to gain an understanding of how the market value of the English and French languages in the Quebec labour market is set.

III.3.1 The Population of Quebec by Language Groups

As shown in Table 3.3, 79,6 per cent of the male population aged fifteen years and over is French-speaking; for the whole population of Quebec the figure is 80,7 per cent, as shown in Table 3.6.

Table 3.6

Population of Quebec, classified according to Mother Tongue, 1971

	Mother Tongue			
	English	French	Other	All Individuals
Numbers	788,830	4,866,410	372,525	6,027,765
Percentage	13,1	80,7	6,2	-

Source: 1971 Census of Canada, Volume 1, Part 4 (Bulletin 1.4-5), Table 11, Statistics Canada (#92-733).

As a matter of fact, individuals of French ethnic origin have been the majority in the province of Quebec since Confederation (Quebec, 1952, p. 66; 1961, p. 63). This means that the mother tongue of the majority of residents in the province of Quebec has been French for the last one hundred years.

While Francophones are a majority in the whole of Quebec, they represent a smaller share of the population in the Montreal area since this is where most Anglophones and almost all individuals who are neither Anglophones nor Francophones are found. Table 3.7 shows the breakdown by language groups of the population of Montreal for 1971.

Table 3.7

Population of Montreal, classified according to Mother Tongue, 1971

	Mother Tongue			
	English	French	Other	All Individuals
Numbers	596,305	1,817,285	329,645	2,743,235
Percentage	21,8	66,2	12,0	-

Source: 1971 Census of Canada, Volume 1, Part 4 (Bulletin 1.4-5), Table 12, Statistics Canada (#92-733).

As a result of Francophones being four-fifths of the population of Quebec, the majority of consumers in Quebec are Francophones. However, as it was pointed out in Chapter II, not only the number of consumers but also their purchasing power has an impact on the demand for language-specific goods and services. It is, therefore, interesting to note that in the whole of Quebec, looking at males aged fifteen years and over, one finds that the anglophone group represents 16,6 per cent of the francophone population but that their earnings represent 22,2 per cent ot those of the francophone group. In the Montreal area, the respective percentages are 33,2 per cent and 44,2 per cent. So Francophones have a greater purchasing power than Anglophones in Quebec

but less so in Montreal than in the remainder of the province. As a result, one would expect that Anglophones employed in consumer oriented activities, for example as salespeoples or as employees in the Trade sector, who work outside Montreal, will attain higher net returns to knowing French than those who work inside the Montreal area. On the other hand, Francophones should see their knowledge of English better rewarded in the Montreal area than outside of it.

The fact that Francophones are a majority of the Quebec population and that Quebec is a parliamentary democracy means that one would expect a majority of members of the National Assembly to be Francophones, which was the case in 1970 (Turgeon, 1972). As a result of that, one expects the majority of ministers to be Francophones. Since they may be assumed to play the role of owners in their various ministries, one would then expect them to prefer using French as a language of work (8). As a result, Francophones, who in many cases need not know English since the users of their services are mainly Francophones and since technology is not an important input, are likely to occupy the senior administrative jobs in the Government of Quebec since they speak French better than Anglophones. If Francophone ministers also prefer working with members of their own ethnic group, then they would occupy an even greater proportion of those jobs. As a matter of fact, in the Quebec civil service in 1975""... un pour cent des hauts fonctionnaires actuellement disent avoir comme langue maternelle l'anglais, 98,3% disent que le français est leur langue maternelle..." (Quebec, 1977).

The fact that a majority of Quebeckers are Francophones means that they will be a majority of voters in most local governments, hospital, and school boards elections, which will lead to Francophones heading those bodies and to French being used as the language of work. On the other hand, mainly in the Montreal area, Anglophones will be a majority of voters in some boards and local governments, leading to the election of anglophone administrators and to English being the language of work in those institutions.

The provincial government, hospital boards, local governments, and school boards are not the only providers of public sector services in Quebec. The federal government provides services to the population of Quebec, and to do so, it hires employees in Quebec. However, since the majority of Members of Parliament and ministers are Anglophones, it leads to English being the main language of work in the federal services (Canada, 1973). This can be understood when one examines the weight of the Francophone community in Canada.

Table 3.8

Population of Quebec and Canada, 1971

Population Groups	Number of Individuals	Percentage of Canadian Population
Quebec's Francophones	4,866,410	22,6
Canada's Francophones	5,792,710	26,9
Quebec's Population	6,027,765	27,9
Canada's Population	21,568,310	-

Source: 1971 Census of Canada, Volume 1, Part 4 (Bulletin 1.4-5), Table 10, Statistics Canada (#92-733).

Hence, it is plausible that bilingualism would be an attribute that many federal civil servants in Quebec would be endowed with since their internal working language would be English but their external working language, the language of the people they provide services to, is French. As a result, ceteris paribus, one could expect bilingual employees of the federal civil service to earn more than unilingual Francophones in Quebec. There is some evidence that in 1965, for the whole of Canada, bilingual Francophones earn more than unilingual Francophones but less than Anglophones (Beattie et al, 1972).

So, to conclude, the fact that Francophones are a numerical majority in Quebec should have an impact on the language that goods are available in and on the language of work of the provincial and local civil services. This in turn should influence the relative values of various language skills in Quebec. The use of languages will be examined in detail in the fourth part of this chapter. Before that, however, three other factors that can have an influence on the relative value of languages in a bilingual labour market remain to be examined.

III.3.2 The Private Sector in Quebec: its Ownership by Language Groups

It was argued in the theoretical framework put forward in Chapter II that the ownership of a firm by individuals of one mother tongue or another should have an impact on the use of language in that firm and on the returns to language of individuals working for it. It is not possible, however, to ascertain the ownership of every firm in Quebec. It is feasible, however, to examine the ownership of broad industry groups and to use this information in the examination of the cause of differences in the earnings of individuals.

The only source of data on the ownership of entreprises for the whole of the Quebec economy is the study done by Raynauld (1974) that measures the ownership of ten major industrial sectors in the early sixties. To carry out this study, Raynauld drew a sample of firms from a list of firms prepared by Statistics Canada. He then used both public sources of information, such as Scott's Quebec Industrial Directory, and confidential information, obtained

from an analysis made of the statements filled in 1962 in compliance with the Corporations and Labour Unions Returns Act (Calura), to establish the ownership of a given firm. As a result of the nature of his sample and of his information on ownership, Raynauld's numbers are useful in assessing the ownership of industries in Quebec if one accepts his procedure for determining ownership which is outlined below (1974, p. 19).

> Nous résumons ainsi nos procédures d'identification des entreprises. Ces procédures comportent deux étapes. La première visait à distinguer les entreprises étrangères des entreprises canadiennes, une entreprise étant considérée comme étrangère lorsque 50% au moins du capital-action appartient à des résidents étrangers, et vice versa; la seconde, à classer les entreprises canadiennes selon qu'elles sont canadiennes-françaises ou canadiennes-anglaises, une entreprise étant considérée comme canadienne-française lorsque la majorité des membres du conseil d'administration offrent des noms à consonance française, et vice versa. Les secteurs de l'agriculture et des services font exception à ces règles, les entreprises étant réparties en deux catégories de propriétaires seulement: canadiens-français et canadiens-anglais. En ce qui concerne l'agriculture, sont définies comme canadiennes-françaises les exploitations dont le "chef de ferme" est d'origine française (au recensement de 1961) et comme canadiennes-anglaises toutes les autres. Quant aux services, sont classés comme canadiens-français les établissements qui utilisent le formulaire francophone du questionnaire annuel du Bureau fédéral de la statistique, et vice versa.

The results obtained by Raynauld indicate the number of employees in broad economic sectors that work for firms owned by French-Canadians, English-Canadians, and foreign owners. They are found in Table 3.9.

There has been no study done to update the work of Raynauld except for the work by Dagenais and Van Peeterssen (1973) which examines the manufacturing sector in 1970 (9). They used Scott's Quebec Industrial Directory to establish the list of firms they study and the criteria outlined below to classify firms as French speaking, English speaking, or bilingual (1973, p. 62).

Table 3.9

Quebec, Percentage of Employees in Firms Owned by French-Canadians, English-Canadian and Foreigners, Early Sixties

Industry	French-Canadian	Total	Others English-Canadian	Foreign
Agricultural	91,3	8,7	8,7	-
Non agricultural	43,2	56,8	40,4	16,4
Mining	6,5	93,5	53,1	40,4
Manufacturing	21,7	78,3	47,0	31.3
Transport	37,5	62,5	49,4	13,1
Finance	25,8	74,2	53,1	21,1
Construction	50,7	49,3	35,2	14,1
Trade	56,7	43,3	35,8	7,5
Services	71,4	28,6	28,6	-
Total, Private	47,3	52,7	37,7	15,0

Source: Raynauld, A., La Propriété des Entreprises au Québec, Montréal, P.U.M., 1974, (1) p. 44, II-1, (2) p. 63, II-17A, (3) p. 45, II-2, (4) p. 50, II-6B, (5) p. 55, II-10B, (6) p. 60, II-15, (7) p. 53, II-9, (8) p. 58, II-13B, (9) p. 62, II-16B, (10) p. 64, II-17B.

Nous avons considéré comme présumée francophone une entreprise pour laquelle

- la consonance des noms des directeurs est française;
- les réponses au questionnaire envoyé par la firme Scott étaient en français
- la langue désirée de correspondance était le français ou le français et l'anglais indifféremment.

Une entreprise sera présumée anglophone

- si la consonance des noms des directeurs, la langue de réponse au questionnaire et la langue désirée pour la correspondance est l'anglais.

Et finalement, une entreprise sera considérée comme bilingue

- si indifféremment, l'emploi des deux langues est désiré pour la correspondance, sauf si les dirigeants ont des noms à consonance française et si le questionnaire de Scott a été rempli en français.

Neglecting bilingual firms, one finds that in 1970 twenty-five per cent of the workers in the manufacturing sector worked for firms owned by Francophones. This percentage is close to the 21,7 per cent that Raynauld had found in the early sixties. It would then seem that there has not been a substantial change in the ownership of the manufacturing sector in Quebec between the early sixties and 1970 and that it may be reasonable to assume that the overall ranking of sectors by ownership found by Raynauld still holds in 1970.

Raynauld's numbers, however, do not indicate if foreign-owned firms are

owned by Anglophones or Francophones. Given the historical patterns of foreign ownership in Canada it would seem reasonable, however, to assume that they are owned mainly by American or British investors, that is Anglophones. This is borne out by the following two sets of facts.

- In 1970, employment in foreign-owned manufacturing firms in Quebec was thirty-six per cent of all employment; employment in American manufacturing firms was twenty-eight per cent of all employment, that is three quarters of employment in foreign-owned manufacturing firms (Canada, 1976, p. 70).

- In 1970, ninety-six per cent of dividents payed to direct foreing investors went to the United States and United Kingdom (Canada, 1977, p. 186). Figures on recent investment show a similar picture (Canada, 1977, p. 89).

To conclude, the earnings of Francophones should, ceteris paribus, be lower in those industries where there is little francophone ownership and higher in those industries where they control a fair number of firms. This results from the preference of owners for their mother tongue as the language of work of their firms, a preference that gives easier access to management jobs to Anglophones than to Francophones in those sectors where anglophone ownership is high.

III.3.3 The Language of Technology in Quebec

A third factor of importance in setting the relative market value of two languages in a bilingual labour market is the language of technology. This is the case since it has an impact on the productivity of those who use physical capital, since those who best understand the relevant instructions can best utilize the machines at their disposal. While it is impossible to find an exact measure of this precise variable in the case of Quebec, the various points singled out below tend to suggest that English was important in defining the language of technology in Quebec in 1970.

The first point is that in 1965 ninety per cent of the remittances made by Canadian subsidiaries of foreign firms in payment for patents and manufacturing processes went to the United States (O.E.C.D., 1970). The second point is that in 1972 eighty-nine per cent of all foreign issued licences held by firms in Canada had been issued by English-owned firms (Canada, 1977). The third point is that seventy-four per cent of the machinery and equipment purchased by firms in Quebec in 1966 was imported, mainly from the remainder of Canada and the United States (Lefort and Marshall, 1972). As to the machinery and equipment produced in Quebec, Raynauld's numbers indicate that less than twenty per cent of the value added in that sector came from firms controlled by Francophones (Raynauld, 1974, p. 80). Finally in 1970 it was found that less than twenty per cent of the value added in that sector was in Francophone firms (Dagenais and Van Peeterssen, 1973, p. 70).

The numbers reported above suggest that Quebec is fairly dependent on English-speaking suppliers of machinery and technology. It would then not be surprising if the language of technology was English. What one finds is that in the manufacturing sector in 1970 twenty-four per cent of technical instructions given to workers were in English only, sixty per cent in both languages and sixteen per cent in French only (Ecole de Relations Industrielles, 1971, p. 140). This figure, obtained from a survey of manufacturing firms, is supported by the results of a survey carried out in 1970 on the language of work in Quebec. Almost five thousand individuals were interviewed (Carlos, 1973) and it

was found that on average Francophones used English 42,9 per cent of the time when reading documents, while Anglophones used French only 13,3 per cent of the time (Carlos, 1973, p. 94). For Francophones this is the aspect of their job that, on average, requires the greatest amount of English; indeed, in the case of the manufacturing workers, Francophones used English 53,4 per cent of the time (Carlos, 1973, p. 331). Since reading documents is a task often associated with the transmission of technological information, this also points to an important role for English in making technology available to workers in Quebec.

These figures suggest that English is likely to be the language of technology used by Francophones, while the reverse is much less likely for Anglophones. As a result, one would expect, everything else being equal, to see Anglophones earn more in technology-intensive jobs than Francophones. Indeed even if the appropriate documents were translated so as to make the same technology accessible in both French and English, Anglophones working in technology-intensive jobs would still earn more than Francophones since, given that translation takes time, they would be working with, on average, more recent technology (10).

III.3.4 The Language of the External Marketplace

The last factor that will be examined to understand how the value of English and French are set in the Quebec labour market is the language in the markets that its workers can move to with relative ease, usually those adjacent to it, and the language in the markets it exports its goods to.

As it was shown in Table 3.8, most Francophones in Canada live in Quebec. Hence, in Canada, Francophones are not likely to find, outside Quebec, labour markets where they can easily work in French. As to the other contiguous labour market, the United States, it is also one where French is not a language used in the workplace. As a result, Francophones in Quebec are largely confined to the Quebec labour market if they want to work in French in North America.

As argued in Chapter II, the language of the markets surrounding the bilingual labour market is important in setting the relative values of the two languages since it can make one, both, or none of these languages useful in external trade, in both goods and services. In the case of manufactured goods, fifty per cent of Quebec's manufacturing output in 1971 was sold within Quebec, thirty per cent sold to other provinces, and twenty per cent to other countries, with the United States accounting for two thirds of those exports (Fréchette et al., 1975, p. 330). In the case of all goods, data are available only on shipments outside Canada; one finds that in 1973 the United States received sixty per cent of all exports shipped from Quebec (Fréchette et al., 1975, p. 328). Finally, in the case of services, it would seem that Montreal, because of the presence in that city of head offices like those of the Royal Bank, the Bank of Montreal, Air Canada, Canadian National Railways, and Canadian Pacific Railways, exports head office services to the remainder of Canada, and English-speaking market.

As a result of the linguistic environment around Quebec, one would expect that, everything else being equal, Francophones will earn less than Anglophones since they are less mobile (Nickson, 1967; Canada, 1970), and since their language is not of use in serving purchasers in the external market place. In

that case, the difference in earnings should be higher in export oriented industries since English becomes more useful in those sectors.

III.4 The Use of Languages in Quebec

In the preceding part of this chapter, the impact of four factors on the use of English and French in the Quebec labour market was examined and various inferences were drawn as to: the use of English and French in various occupations, the breakdown by language groups of the workforce in various occupations and industries, and the impact on the earnings of individuals of knowing either English or French or both, everything else being equal. In the remainder of this chapter, the inferences as to the use of English and French in various occupations and industries in Quebec will be examined. This is done since it is assumed there is link between the use of a language at work and the returns to that language; these returns will be examined in the last two chapters. As to the differences in occupations, this thesis does not examine them. However, the interested reader will find in Appendix F information on the presence of Anglophones and Francophones in various occupations and industries in 1971.

The information used to examine the use of English and French at work in Quebec is taken from a survey conducted for the Commission d'Enquête sur la Situation de la Langue Française et sur les Droits Linguistiques du Québec. That survey is the most complete source of information on the language of work in Quebec. The sample was selected by census tract so as to insure that it was a representative one. A total of 4,914 respondents gave full information to the interviewers. Therefore, the care shown in selecting the sample and its size makes for fairly reliable results (Carlos, 1973).

Table 3.10 summarizes the situation as to the use of English by Francophones in Quebec.

Table 3.10

Overall Use of English by Francophones in the Workplace, Percentage of time in the Workplace during which it is used

Industry	Occupation			
	Managers	Clerks	Salesclerks	Production Workers
Manufacturing	23,8	22,9	20,0	10,5
Trade	16,6	17,4	14,4	-
Finance	20,5	21,9	11,2	
Services	19,9	12,7	-	-
Government	13,5	18,7	-	-

Source: L'utilisation du français dans le monde du travail du Québec, by Serge Carlos, Québec, 1973, Editeur Officiel du Québec, p. 54.

While it is impossible to explain without more detailed analysis than the one carried out here the results shown in Table 3.10, one can still note that

some of the hypotheses on the use of language seem to hold. For example, French salespeople in the Trade and Finance sector use less English than in the Manufacturing sector. One explanation of this may be that the customers served by salesclerks in the Trade and Finance sectors are more likely to be Francophones than those served by salesclerk in the Manufacturing sector. One also notices that English is more often used by Managers in the Manufacturing and Finance sector, where the degree of ownership by Anglophones and the importance of external markets is higher than in the Services and Trade sectors where the reverse is the case. Finally, the Government sector is the one where English is used the least by Managers, evidence that agrees with the fact that Francophones in some sense own the provincial and most local governments in Quebec.

So the results found in Table 3.10 are consistent with some of the predictions drawn from the theoretical framework of Chapter II when applied to the Quebec labour market as to the use of language in the workplace. As to the validity of the predictions on differences in earnings between Anglophones and Francophones in Quebec, they will be examined in the following chapters. Therefore, it seems appropriate to summarize these predictions as a set of testable hypotheses.

The first set of hypotheses (H1) is made for the male employees in Quebec without reference to the industry they work in or the occupation they hold. As a result of the demand and supply for linguistic human capital in the Quebec labour market, it is assumed that, ceteris paribus,

- individuals who know English earn more than those who do not know English. This means that Anglophones and bilingual Francophones earn more than unilingual Francophones (i);

- Anglophones are expected to earn more than bilingual Francophones since their mastery of the English language is greater (ii);

- Bilingual Anglophones are expected to earn more than their unilingual counterparts since they have a greater amount of linguistic human capital (iii);

- Unilingual Anglophones may earn less than bilingual Francophones. They will earn less if the returns to knowing both French and English are higher than the returns to knowing only English, given that unilingual Anglophones master English better than bilingual Francophones (iv). This would make part of (ii) false.

If one takes into account that there could also be discriminatory behaviour by firm owners, then the previous results still hold but Anglophones are even more likely to have higher earnings, ceteris paribus, than Francophones.

The second set of testable hypotheses (H2) is made for individuals working in specific industries. These hypotheses are in addition to the general set of hypotheses and provide additional information for specific industries. It is assumed that, ceteris paribus,

- bilingual employees in the Trade sector earn more than unilingual employees (i);

- the returns to knowing English are higher in sectors where Anglophone ownership is high, that is the Resources, Manufacturing, Transportation and Communications, and Finance sectors, than in the other sectors of economic activity (ii);

- the returns to knowing English are higher in sectors whose markets for head office services are mainly outside Quebec that is Transportation and Communications, and Finance, than in other sectors (iii);

- the returns to knowing English are small in the Government sector (iv).

While these hypotheses on the returns to linguistic human capital are made for the whole of the Quebec labour market, it is plausible that differences in supply and demand of Anglophones may lead to the existence of different rates of returns in the Montreal area and in the whole of Quebec. Furthermore, if there is discriminatory behaviour in the private sector, it will lead to even higher returns for Anglophones.

The third and final set of testable hypotheses (H3) is made for individuals working in specific occupations; once more these are additional hypotheses to the general set of hypotheses. It is assumed that, ceteris paribus,

- individuals working in Sales occupations will earn more if they are bilingual than unilingual (i);

- individuals working in Administration or Applied Sciences occupations will earn more if they are Anglophones than Francophones because of the importance of communication in these occupations (ii);

- individuals working in Education and Health occupations will gain little by knowing English since they work mainly in French serving French consumers (iii).

Once more, if discriminatory behaviour is present, Anglophones will benefit from it, at least in the private sector.

So, in this chapter, the Quebec labour market has been examined in the light of the theoretical framework of Chapter II and a set of testable hypotheses as to the value of English and French were written down. They will be examined in the light of empirical results in the next chapter.

REFERENCES

(1) See Table 3.3

(2) The exclusion of those professionals, such as some doctors and lawyers, who are self employed could result in an overestimate of the gross earnings differences that prevail between all Anglophone and Francophone males in Quebec.

(3) One should note, however, that residents of the other provinces of Canada who migrated to Quebec in 1970 or 1971 are included in the analysis.

(4) In the case of professionals like lawyers or doctors, the exclusion of self-employment income may lead to an underestimation of the returns to education or experience since some of them may supplement their wages and salaries through self-employment. Since individuals whose main source of income was self-employment income are excluded from the analysis, this should not seriously affect the results.

(5) See Table 3.9.

(6) See Table 3.9 for evidence on this point.

(7) It could also be that those who prefer working for the Government are aware of the fact that a university degree is often a condition for employment in that sector.

(8) For data on the 1867-1967 period see "Les hommes politiques du Québec, 1867-1967" in Revue d'histoire de l'Amérique française, 21 (December 1967), p. 599-634, by Robert Boily.

(9) One should also note the work by Sales and his group. See for example Les industriels au Québec et leur rôle dans le développement économique, by Arnaud Sales Québec: Ministère de l'industrie et du commerce, 1977.

(10) This assumes that documents are released as soon as they are available in one language and not held back till a translation is available.

CHAPTER IV

THE RETURNS TO LANGUAGE IN THE QUEBEC LABOUR MARKET

Having argued that, ceteris paribus, knowing English should increase the earnings of those working in the Quebec labour market, it remains to examine that proposition and more specifically the three sets of testable hypotheses written down at the end of Chapter III. Before estimating multiple regressions useful for that purpose, it is necessary in the first two sections of the chapter to define the appropriate variables and the functional form chosen. In the third and main section the regression results are reported and discussed with special attention given to the language coefficients.

IV.1 The Variables

So as to be able to use the sample described in Chapter III for regression purposes, one needs to define an appropriate set of variables. This is done here with each variable defined in turn.

The dependent variable is the natural logarithm of the individual's earnings. This continuous variable is defined as the logarithm of the sum of all wages, tips, bonuses, commissions and amounts of a similar nature received during 1970, gross of deductions but not including payment in goods and services such as room and board (1). Unfortunately, the earnings figure found in the Public Use Sample Tape does not take into account fringe benefits received by employees. So if some employees prefer receiving their compensation for work entirely in wages and others prefer receiving part of it in fringe benefits, differences in pecuniary benefits would appear where there may be no differences in total benefits. However, unless Anglophones and Francophones systematically differ as to how they want to see their compensation for work broken down in wages and fringe benefits, this problem is not expected to bias the principal results of this analysis.

One of the key independent variables is language. It is a set of four dichotomous variables described in Table 4.1. In that table as in the other tables in this part of the chapter, the "Label" column indicates the name given to the variables in various tables.

Table 4.1

Language Variables

Mother Tongue	Language Skills	
	Unilingual	Bilingual
	Label	Label
English	Unilingual Anglophone	Bilingual Anglophone
French	Unilingual Francophone	Bilingual Francophone

Let us note that being bilingual implies that individuals have a minimum level of competence in their second language, English or French. They may, however, be more fluent in English or French than the minimum required to be reported as bilingual in the Census. In Appendix D, the exact language questions of the 1971 Census are presented.

Another independent variable is education. On the Public Use Sample Tape the exact number of years of schooling of an individual is not given, each individual being assigned to one of twelve schooling categories according to his number of years of schooling. Hence, it was decided to use a set of dichotomous variables to represent schooling rather than use an arbitrarily scaled education variable. Such a choice has the added advantage of allowing for a greater flexibility as to the shape of the relationship between education and earnings. Table 4.2 is used to describe the education variables. Only five categories are used so as to insure a sufficient number of degrees of freedom in the analysis when Industry and Occupation subgroups are examined.

Table 4.2

Education Variables

Education intervals found in the Public Use Sample Tape	Assumed number of years of schooling	Label
No schooling	0	Primary 0-8
1-4 years	3	
5-8 years	7	
9-10 years	10	High School 9-10
11 years	11	High School 11
12 years	12	
13 years	13	High School 12-13
University:		
1-2 years	14	Some University
3-4 years	15	
3-4 years: degree granted	16	
5 years and more	17	
5 years and more: degree granted	18	

Note: The column "Assumed number of years of schooling" is used to calculate the experience variable.

Another independent variable is the job experience of individuals. In this thesis it is measured by the following formula:

Experience = Age - ("Assumed number of years of schooling" +6). Such a variable is a better representation of experience than age alone since individuals who have more schooling must, at a given age, have less job-experience than those with less schooling (Mincer, 1974). In the analysis both experience and the square of experience are used. This is done since it is usually found in empirical work that earnings and experience are linked in a non-linear concave fashion (Mincer, 1974; Lacroix and Lemelin, 1977).

Two other independent variables used in some of the regressions whose results are reported in this chapter are the occupation of an individual and the industry he works in. It should be remembered that the breakdown by occupations and industries is constrained by the information available on the Public Use Sample Tape. Table 4.3 and 4.4 describe the industry and occupation variables.

Table 4.3

Industry Variables

Industry Groups in the Public Use Sample	Label
Forestry	Resources
Mines, Quarries and Oil Wells	Resources
Manufacturing	Manufacturing
Transportation Communication Other Utilities	Transportation/ Communication
Finance, Insurance, Real Estate	Finance
Construction	Construction
Trade	Trade
Community, Business and Personal Services	Services
Public Administration and Defense	Government

Table 4.4

Occupation Variables

Occupation Groups in the Public Use Sample	Label
Managerial and Administrative	Administration
Sciences and Engineering	Applied Sciences
Social Sciences	Health/Teaching
Teaching	Health/Teaching
Medecine and Health	Health/Teaching
Clerical	Clerks
Sales	Sales
Other Primary	Primary Workers
Processing	Processing Workers
Machining, Assembly and Repairing	Assembly Workers
Transport Equipment Operating	Transportation Workers
Construction Trades	Construction Workers
Services	Services

The groups found in Table 4.3 and 4.4 were defined so as to insure some consistency within each group and also to insure that there will be sufficient degrees of freedom to permit various regressions to be run.

Another independent variable is the number of weeks worked in 1970 by individuals. Such a variable is included to take into account the work effort of individuals. Since on the Public Use Sample Tape the exact number of weeks worked is not indicated (2), individuals being assigned to one of five weeks worked category, it was decided to use a set of dichotomous variables. The weeks worked variables are presented in Table 4.5.

Table 4.5

Weeks Worked Variables

Number of weeks worked	Label
1-13	1 to 13 weeks
14-26	14 to 26 weeks
27-39	27 to 39 weeks
40-48	40 to 48 weeks
49-52	49 to 52 weeks

Finally, the last independent variable, used only in the regressions for the whole of Quebec, is a variable that indicates if the individual lives in a rural or urban setting, and if so, if it is a small or big town. In Table 4.6 this variable is defined. The rural regions were regrouped to insure a sufficient number of degrees of freedom.

Table 4.6

Region Variables

Regions in the Public Use Sample Tape	Label
Urban, 30,000 and over	Urban, $30{,}000^{+}$
Urban, under 30,000	Urban, $30{,}000^{-}$
Rural, non-farm	Rural
Rural, farm	Rural

A precise description of the construction of all these variables, written in terms of the information found on the Public Use Sample Tape is found in Appendix E. As to interactive variables, say language/education or language/experience, they are not described here nor in Appendix E since they are self-explanatory.

While the variables described above will be used in various multiple regressions to control in some sense for the impact of different factors in earnings, another solution would be to estimate regression coefficients on separate subgroups of the available sample. For example, one can control for weeks worked through the use of the variables defined in Table 4.5 or by the computation of five separate regressions, one for each group of weeks worked. Of course, the two procedures are not equivalent since in the first case the number of weeks worked can only change the intercept term, while in the second case all coefficients can vary from one subgroup to the next. In the regression analysis, both approaches will be used since they permit a better examination of the impact of various variables on earnings. The subfiles will be defined according to the structure of the relevant variable so that there is no need to define them explicitly.

Finally, it should be pointed out that all variables except the earnings and weeks worked variables are recorded as of June First 1971. For example, the information on occupation and industry refers to the week preceding June First. On the other hand, the earnings and weeks worked variables refer to earnings in 1970 (3). It should also be pointed out that the occupational and industrial classifications imposed by the information in the database are very broad which reduces the amount of information gained by using them. Also, because occupations are often defined on an industry basis, as in the case of Construction Workers, it can be inappropriate to use both of them simultaneously in a regression analysis.

Having defined the variables, it is now necessary before reporting the results of the regressions to discuss briefly the choice of a functional form.

IV.2 The Functional Form

In the literature, three functional forms have been suggested as appro-

priate to study the determination of earnings using individual observations. They are the linear form, the log-linear form, a semi-logarithmic form, and the log-log or double logarithmic form. If one writes E for earnings, Ed for education, Ex for experience and Lang for a set of language variables that embody both the mother tongue and the language skills of an individual, the choice is between

$$E = B_1 + B_2Ed + B_3Ex + B_4Lang \qquad (1)$$

$$\text{or} \quad \ln E = B_1 + B_2Ed + B_3Ex + B_4Lang \qquad (2)$$

$$\text{or} \quad \ln E = B_1 + B_2\ln Ed + B_3\ln Ex + B_4\ln Lang \qquad (3)$$

with interactive variables ignored in the discussion for simplicity sake.

Weiss (1970) used an equation of type (1) as well as the researchers of the Royal Commission on Bilingualism and Biculturalism (Canada, 1969), while Mincer (1974) and Carliner (1976) used an equation of type (2). In this thesis the semi-log form, the type (2) equation, will be used for both theoretical and empirical reasons. First, type (1) equations implicitly assume that there is no interaction between the variables unless it is so specified. Hence, taking experience as an example, this means that B_3 is the derivative of E with respect to Ex, and that the value of other variables does not affect the value of B_3. Type (2) equations are suggested by Mincer's work (1974) and allow for implicit interaction between the variables: hence, the derivative of E with respect to Ex will depend on the level of E. Indeed $\frac{\partial E}{\partial Ex} = B_3 .E$ so that $B_3 = \frac{\partial E/\partial Ex}{E}$ and B_3 is the percentage change in earnings (4) resulting from a change in Ex.

Empirical evidence also suggests that using a log-linear function is preferable. For example, Taubman writes that he chooses to use a semi-log function since "... a variety of tests suggested that the semi-log form was statistically better than double logs or linear form" (Taubman, 1976, p. 453). According to Welland (1976, p. 25) there is

> "... strong empirical support for the use of the natural logarithm of earnings as the appropriate dependent variable in earnings regressions. The evidence marginally favours the semi-logarithmic specification of the earnings function over the double logarithmic form. The linear specification is clearly rejected".

This is also the conclusion of Heckman and Polacheck (1974). Furthermore, the use of a log-linear function reduces the problem caused by possible heteroscedasticity (Riboud, 1975) and allows the dependent variable to vary from minus infinity to plus infinity.

For all of these reasons, the choice of a log-linear functional form for empirical work in this thesis seems appropriate and it will be used to estimate the rate of return to language in the Quebec labour market.

IV.3 The Regression Results

In this section of the chapter, the three sets of testable hypotheses put forward in Chapter III are examined in the light of empirical results ob-

tained through the use of regression analysis. The first two parts are given over to a discussion of the first set of testable hypotheses, H1. The first part presents the results obtained when language is assumed to affect only the intercept of the earnings equation while the second part is given over to an examination of the hypotheses that the non-language coefficients differ across the four language skills groups. In the last two parts, the differences in the returns to language across industries (H2) and occupations (H3) are examined.

Let us note that in all of the regressions whose results are reported in this section the dependent variable is the natural logarithm of annual earnings, a choice discussed above and the following variables are excluded, becoming the reference catagory for the appropriate set of dichotomous variables: "unilingual Francophone" from the language set, "Primary 0-8" for the education set, "1 to 13 weeks" for the weeks worked set and "rural" for the region of residence; other exclusions will be pointed out where appropriate. Finally in all tables of regression results the "t-ratio" is the statistic found in brackets below each coefficient; a * next to the coefficient indicates that it is significant using a one-tailed t-test at the ninety-five per cent confidence level while two ** indicates that it is significant at the ninety-nine per cent level.

IV.3.1 The Returns to Language in the Quebec Labour Market: The Intercept Effects

It was argued in Chapter II that the impact of at least three human capital variables had to be examined to understand the earnings of individuals in the Quebec labour market: they are education, experience, and language. Furthermore it was argued that in labour markets where more than one ethnic group was present one had to take into account the ethnicity of individuals when explaining their earnings. This approach is similar to the one used by Mincer when he examined the earnings of white males in the United States (Mincer, 1974). The main difference is that no ethnic or language variables were included since the make-up of that population made them unnecessary to the analysis. In Table 4.7, the coefficients of regressions calculated for both the whole of Quebec, referred to as Quebec, and the Montreal area using those variables are presented. These results are presented so as to permit a comparison with Mincer's work.

Table 4.7

Regression Results, Final Sample,
Quebec and Montreal, Origianl Equation
Males, 1970

Variables	Coefficients for Quebec	Coefficients for Montreal
Constant	7.00416 ** (286.70215)	7.06161 ** (190.28949)
Language		
Unilingual Anglophones	.19545 ** (6.41922)	.10671 ** (2.77528)
Bilingual Anglophones	.19093 ** (6.52385)	.11532 ** (2.91042)
Bilingual Francophones	.15663 ** (9.41359)	.07917 ** (2.87556)
Education		
High School 9-10	.21475 ** (10.45892)	.19700 ** (6.40811)
High School 11	.34176 ** (13.10145)	.31190 ** (8.27348)
High School 12-13	.32871 ** (12.33835)	.36684 ** (9.58581)
Some University	.75114 ** (28.86450)	.80463 ** (21.82044)
Experience		
Experience	.11055 ** (64.72566)	.11380 ** (46.02795)
$(\text{Experience})^2$	-.00175 ** (-53.64981)	-.00182 ** (-37.76911)
Adjusted R^2	.35623	.36352
F Statistic	607.71	296.09
# of Individuals	9869	4638

The equations are significant overall for both Montreal and Quebec as the F statistics show. The R^2 adjusted for degrees of freedom, which is the one reported in all tables in this section, is slightly greater than the one found by Mincer (1974, p. 92) when regressing the logarithm of earnings on schooling and experience in the United States, a fact that could be explained by the presence of the language variables that capture both additional ethnic and human capital characteristics.

The experience coefficients are significant, fairly close to those found by Mincer (1974, p. 92) and show a concave earnings-experience profile reaching a peak at the experience level of thirty-two in Quebec and thirty-one in Montreal. The education coefficients are also significant, and of the expected signs and magnitudes except for the fact that a grade eleven education brings higher returns to an individual than a grade twelve or thirteen education in Quebec. This could be a result of the fact that grade eleven was until recently the traditional high school leaving grade in Quebec. As with the coefficient of other dichotomous variables, the education coefficients refer to proportional earnings differentials.

The language coefficients are significantly different from zero and of the right signs and relative magnitudes. As such, they show that knowing English, ceteris paribus, increases the earnings of an individual in Quebec and Montreal; this means that H1 (i) cannot be rejected. To see, however, if there are significant differences between those knowing English, additional t-tests need to be performed according to the following formula:

$$t = \frac{\hat{\beta}_2 - \hat{\beta}_1}{\sqrt{\text{var } \hat{\beta}_1 + \text{var } \hat{\beta}_2 - 2 \text{ cov } \hat{\beta}_1 \hat{\beta}_2}}$$

with $\hat{\beta}_1$ and $\hat{\beta}_2$ the estimated regression coefficients, var $\hat{\beta}_1$ and var $\hat{\beta}_2$ their variances, and cov $\hat{\beta}_1 \hat{\beta}_2$ their covariance, and the difference being significative if the t-statistic is greater than the appropriate value.

The differences between the language coefficients reported in Table 4.7 and the t-statistics associated with them are reported in Table 4.8. A * indicates that the difference is significantly different from zero (5), using a one-tailed test for the first and third differences examined there and a two-tailed test for the second line; this will be the case for all similar tables.

Table 4.8

Significance test of Differences between
Language Coefficients, Full Sample
(t-statistics in brackets)

	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-.00452 (-.12080)	0.00861 (0.20351)
Unilingual Anglophones- Bilingual Francophones	0.03882 (1.30125)	0.02754 (0.83802)
Bilingual Anglophones- Bilingual Francophones	0.03430 (1.19781)	0.03615 (1.04794)

As Table 4.8 shows, there are no significant differences at the ninety-five per cent confidence level. At the eithty per cent level, however, Anglophones, bilingual or not, earn more than bilingual Francophones in both Quebec and Montreal.

Is the equation presented in Table 4.7 the proper one to use, however? In the literature, other factors are usually taken into account when annual

earnings are being explained, and the results of regressions along those lines will be discussed below. It is interesting to note, however, that Raynauld and Marion argued that in the case of Quebec one could be, when explaining earnings, "... justifiés de ne retenir que la différence d'âge dans la normalisation des populations... (since) le niveau d'éducation devient aussi un effet de la ségrégation des facteurs" (Raynauld and Marion, 1972, p. 15). Implicit in that position is that the higher level of education of the Anglophones, compared to that of the Francophones, is the result of, rather the cause of, their superior economic position. That superior position could be explained by the fact that the Francophones were conquered in 1760 and that their 1837 uprising failed (Hamelin, 1973). Such an approach would, in our view, overestimate the role of language in explaining the earnings of individuals in the Quebec and Montreal labour markets. The results of such a regression are reported, however, in Table G-1 for comparative purposes. The language coefficients indicate that knowing English increases the earnings of male employees in both Quebec and Montreal, lending support to H1 (i); furthermore the Anglophones, bilingual or not, earn significantly more than the Francophones, as the t-statistics in Table G-5 show, lending support to H1 (ii).

The equation used in Table 4.7 does not take into account the amount of time individuals worked during 1970 and their region of residence. An increase in time worked should, according to economic theory, have a positive direct impact on earnings; in this case, it will be measured by the usual variable, that is the number of weeks worked. The region of residence which in this study is either (i) urban with a population of more than 30,000, (ii) urban with a population less than 30,000 or (iii) rural should have an impact on earnings, with them higher in urban areas. There are two reasons usually put forward for this; first, the size of the region of residence usually indicates the size of the labour market the individual works in: the bigger the labour market, the higher the likelihood of a perfect matchup between the skills of an individual and the tasks required of him, which means higher productivity and earnings. Secondly, the bigger the city an individual lives in, the higher, usually, is the cost of living; this should lead him to seek higher nominal wages than if he were living in a rural area. The results obtained when those variables are included in the regression analysis are found in Table 4.9.

Those results and those of other equations will raise an interesting question; why, given the rate of return to knowing English are all Francophones not bilingual? One possible explanation is that they have a preference for remaining unilingual. Another possible explanation is that the cost of learning English are such that the net returns to with an investment are less than those of acquiring extra schooling. This could be important in areas outside Montreal where the quality of the teaching of English in schools is weak and the opportunities to learn it through interpersonal contacts during schooling years not numerous. Of course both explanations may have a role to play (6).

Table 4.9

Regression Results, Final Sample
Quebec and Montreal, General Equation

Variables	Coefficients for Quebec	Montreal
Constant	5.98021 **	5.91547 **
	(214.57536)	(141.87117)
Language		
Unilingual Anglophones	.12871 **	.11148 **
	(5.40899)	(3.68169)
Bilingual Anglophones	.13583 **	.11321 **
	(5.94950)	(3.63717)
Bilingual Francophones	.09945 **	.05738 **
	(7.56092)	(2.64939)
Education		
High School 9-10	.12398 **	.14334 **
	(7.79054)	(5.92398)
High School 11	.21798 **	.22720 **
	(10.75658)	(7.64436)
High School 12-13	.27298 **	.28959 **
	(13.16639)	(9.61350)
Some University	.59019 **	.64334 **
	(29.05101)	(22.05190)
Experience		
Experience	.06531 **	.06930 **
	(45.66070)	(32.83581)
$(\text{Experience})^2$	-.00103 **	-.00111 **
	(-38.78086)	(-27.59077)
Weeks Worked		
14-26 weeks	.84144 **	.94043 **
	(28.41088)	(19.54287)
27-39 weeks	1.34745 **	1.34846 **
	(46.92727)	(28.79109)
40-48 weeks	1.65763 **	1.76018 **
	(60.30317)	(39.77407)
49-52 weeks	1.80802 **	1.92175 **
	(74.60007)	(49.00987)
Regions		
Urban 30,000	.05181 **	-
	(3.09295)	
Urban 30,000 -	.07389 **	-
	(3.89969)	
Adjusted R^2	.61721	.60851
F Statistics	1061.72	555.41
# of Individuals	9869	4638

As shown by the F statistic, the equation used to calculate the results of Table 4.9 is highly significant overall. Furthermore, all the coefficients are significant and have their expected signs. As could be expected (Mincer, 1974) the adjusted R^2 of those equations is higher than the adjusted R^2s found in Table 4.7 and the values of the education and experience coefficients are lower in Table 4.9 than in Table 4.7 which indicates that they previously captured some of the effects of the difference in weeks worked; as Mincer puts it "... on the average, longer-schooled individuals work more weeks during the year" (1974, p. 54).

The experience coefficients are of the expected sign and relative magnitudes and show a concave earnings-experience profile peaking at thirty-two years of experience in Quebec and thirty-one in Montreal. The education coefficients are also significant and of the expected signs and relative magnitude. As to their significance, they may capture the effect of human capital or of screening or of both. With the amount of information available, this is impossible to ascertain but it is clear that education has an impact on the earnings of indidivuals.

With respect to the education variable, it must also be pointed out that the choice of such a broad education category as that of Some University was imposed by the size of the sample, especially when consideration is given to the need of breaking it up into occupation and industry subgroups. It could be argued, however, that this may have some impact on the language coefficients since Anglophones may differ from Francophones as to their number of years of university schooling, being on average more educated; this could bias upward the Anglophone language coefficients. However, evidence from the study of the Highly Qualified Manpower Survey of 1973 (Ahamad, 1977) indicates that, at least for all of Canada, Francophones earn less than Anglophones even when differences in degree levels are accounted for.

It is also interesting to note that Chiswick finds, using aggregate data from the 1961 Census and regressing the logarithm of earnings on education only, a rate of return of .08 for each year of education for Quebec males aged twenty-five to sixty-four (Chiswick, 1974, p. 184). Given the greater number of independant variables in this model, the results reported above and in Table G-4 are not at odds with that result.

The weeks worked coefficients have the expected signs and relative magnitudes and are significant. Their inclusion, rather than the use of weekly earnings as the dependent variable, was dictated by the lack of information on the exact number of week worked, information needed to calculate weekly earnings. Their inclusion, however, raises a problem of simultaneity since annual earnings are determined by the wage rate and the amount of time worked while the amount of time worked is the result of a choice made given an income-leisure constraint. Hence, including weeks worked as a set of independent variables implies that the number of weeks worked is assumed to be determined by demand factors outside the control of the individuals.

The regional variables are significant: the higher value for the smaller urban areas could easily be the result of the choice of suburban towns as a residence by many who work in larger adjoining urban areas.

The language coefficients show that knowing English increases the earnings of individuals in both Quebec and Montreal lending support to the H1 (i) hypothesis. Furthermore, as Table 4.10 shows, Anglophones earn significantly

more than bilingual Francophones in both Quebec and Montreal, that being true only at the ninety per cent level for unilingual Anglophones in Quebec. This lends support to the H1 (ii) hypothesis; on the other hand, one notes that bilingualism does not increase the earnings of Anglophones.

Table 4.10

Significance test of Differences between Language Coefficients, Full Sample (t-statistics in brackets)

	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	(0.00712) (0.24421)	(0.00173) (0.51926)
Unilingual Anglophones- Bilingual Francophones	(0.02926) (1.28314)	(0.05410) * (2.09007)
Bilingual Anglophones- Bilingual Francophones	(0.03638) * (1.67808)	(0.05583) * (2.05235)

Source: Table 4.9

Criticisms can be levelled at the equation used to obtain the results of Table 4.9 since it does not truly capture the ultimate causes (Blinder, 1973) of earnings differences such as I.Q., family background and, in this case, all of the impact of ethnicity. It could be argued, leaving aside other basic individual characteristics, that language has an impact on the choice by an individual of his education and occupation and that a more complete model, where these impacts are examined, would be more appropriate (Blinder, 1973). The information available in the database unfortunately precludes that option. It is likely, however, that this results in an underestimate of the importance of the mother tongue of an individual in explaining his earnings. This reinforces the likelihood that statistically significant differences in earnings between Anglophones and Francophones are indeed true differences. In the case of the United States, Blinder (1973) argues that "personal characteristics equations" (Oaxaca, 1973) similar to those whose results are reported in Table 4.9, understimate the amount of discrimination against blacks in that labour market.

Using the results of Table 4.9 to compare Quebec and Montreal, it is interesting to note, however, that the knowledge of English brings higher relative returns in the whole of Quebec than in Montreal only. Taking into account that about half the individuals used to estimate the Quebec equation are from Montreal, it therefore seems that in Quebec knowing-English is relatively more valuable outside the Montreal area than inside it. This is surprising since demand considerations such as the concentration of French-Canadian firms outside Montreal and of English-Canadian and foreign firms inside the Montreal area (Raynauld, 1974) could be expected to lead to a greater use of English in the Montreal area than in the remainder of Quebec. Indeed, in the manufacturing sector, technical instructions are available only in English for thirty-three per cent of the workers in the Montreal area; that percentage drops to ten outside Montreal (Ecole de ..., 1971). This should lead to a greater relative value of English in the Montreal area than in the remainder of Quebec.

One possible explanation is that supply differences more than account for the greater demand for English-speaking workers in the Montreal area, leading to the differences observed in the rates of returns. As Table 3.3 shows, most anglophone workers in Quebec live in the Montreal area : they represent twenty-one per cent of the workers of that area compared to thirteen per cent for the whole of Quebec. Furthermore, as Table 3.4 shows, two-thirds of the francophone workers residing in the Montreal area are bilingual while this figure drops to less than one-half for the whole of Québec; hence, the supply of English-speaking workers in Montreal is greater than in the remainder of Quebec. As a result, English is relatively less valuable to both Anglophones and Francophones inside Montreal than outside Montreal.

The above argument would hold if it was the case that English must be used in certain type of occupation such as those of managers; this could be a result of the ownership of the firm or of the type of relationships it maintains with the outside world. Then the relative lack of English-speaking employees outside Montreal would mean that they would be mainly found in better paying jobs where English must be used. On the other hand, in Montreal the relative abundance of English-speaking workers will lead firms to hire them for jobs for which English is useful but not essential; these jobs are likely to be lower-paying jobs than those where English is an essential requirement.

The results reported in Table 4.9 for Quebec do not allow us to observe exactly the impact of adding the amount of weeks worked as an explanatory variable since both that variable and a set of regional variables were added. The interested reader will find in Table 2 of Appendix G an equation for Quebec without regional variables. The coefficients are very similar to those of Table 4.9 and will therefore not be discussed further.

While the effect of the number of weeks worked on earnings can be accounted for by putting it in the earnings equation as an independent variable, another way of doing this is to calculate separate earnings equations for groups of individuals who worked the same number of weeks. This was done for individuals who worked more than forty-eight weeks in 1970 and the results are reported in Table 2 of Appendix G. The coefficients of the non-language variables are significant and of the expected signs and relative magnitudes. The language coefficients show that knowing English increases, ceteris paribus, the earnings of individuals, and that Anglophones earn more than bilingual Francophones, as the t-statistics of Table G-5 show.

Up to now industry and occupation variables have been excluded from the independent variables used in the regression analysis. This choice was made because we felt that the equation used in Table 4.9 captures the total effect, both direct and indirect, of human capital on earnings. This distinction between the direct and indirect effects of human capital was made, for example, by Kalacheck and Raines (1976) who argued that using an earnings equation with human capital variables and without demand-type variables such as occupation or industry was the correct way of capturing "the total effect" of human capital on earnings. The inclusion of demand-type independent variables simply permits the breakup of the impact of human capital on earnings in direct effects and in indirect effects that manifest themselves through routing variables.

Such an approach is in agreement with our view that earnings, industry, and occupation are all the results of the interplay of demand and supply forces and that to explain the first item by the last two is incorrect, particularly

since we are estimating a type of reduced form equation (Mincer, 1974).

That approach has also been defended by, amongst others, Raynauld and Marion who wrote, with respect to the differences in earnings across language groups in Quebec, that:

> "Nous n'avons pas retenu les effets sur les écarts de revenus, des structures professionnelles et industrielles de l'un et de l'autre groupe. A notre avis, ces deux facteurs sont des effets de la ségrégation plutôt que des causes. En d'autres termes, le fait que les travailleurs d'un certain groupe se retrouvent au bas de la hiérarchie professionnelle, indépendamment de leur niveau d'éducation, est un effet et non une cause. Seules les différences dans le niveau d'éducation et le profil d'âge sont des causes originelles des écarts de revenus" (1972, p. 14).

However, to insure that this choice did not bias the language coefficients, a set of regressions were run with industry variables and occupation variables; the results for the two sets of regressions are found in Table 3 of Appendix G. When industry variables are included, the coefficients of the standard equation remain unchanged for both Quebec and Montreal. The language coefficients do not change very much: the extra earnings that result from knowing English are still to be found lending support to the H1 (i) hypothesis. Anglophones still earn significantly more than bilingual Francophones in Montreal but their significant advantage disappears in Quebec.

It is interesting to note, however, that "... the industrial patterns of premiums and discounts seems to reflect the degree to which activities are protected from competitive forces in the product or labour market" (Kalacheck and Raines, 1976, p. 501). Here the Trade and Services sectors, where unionization is traditionally low and competition alive, show the highest discounts while the Construction sector, where unions are strong, and the Government and Finance sectors, the latter of which is, in Canada at least, not subject to strong competitive forces, pay relatively higher earnings. The reference categories are the Resources sector for the whole of Quebec and the Manufacturing sector in Montreal.

When occupation variables are included, with Primary occupations as the reference category, the coefficients of the standard equation appear to change somewhat. The language coefficients still indicate that knowing English increases the earnings of individuals in both Quebec and Montreal. They also show that in both cases bilingual Anglophones earn more than bilingual Francophones. However, controlling for differences in occupations would seem to have some impact on the difference between the earnings of unilingual Anglophones and bilingual Francophones. This dovetails well with the evidence in Appendix F which shows a greater proportion of Anglophones in occupations like Administration and Applied Sciences than in the population as a whole.

One notes, however, that when occupations are included, the returns to job experience are slightly lower and the returns to education are all lower with the decrease widening as one goes up the educational ladder. This is not surprising and dovetails well with the findings of Kalacheck and Raines that tra-

ditional human capital performs "routing functions" allowing the individual to gain access to better jobs (1976) and with the findings of Mayhew that "... education has different occupational and income effects for those who attend college and for those who do not ..." (1971, p. 224). As to the occupation variables, they have higher t-ratios in the case of Quebec than for Montreal; in both cases, however, a pattern of premium and discounts similar to that found by Kalacheck and Raines (1976) prevails. Administrators or Construction Workers earn more than Salespeoples or employees of the Service sector.

To summarize, the introduction of industry and occupations as independent variables indicate that these characteristics may have some impact on the returns to an individual's skills and abilities. To investigate this in depth and, therefore, to examine if H2 and H3 hold, it is necessary to estimate regressions for appropriate industry and occupations subgroups. Before doing this, however, it must be noted that up to now, the impact of language on earnings has been assumed to manifest itself through a set of dichotomous language variables. This means that the language of an individual has an impact on his earnings through shifts of the intercept terms and not through changes in the coefficients of the non-language variables. In the next section, the equality of the coefficients of the non-language variables is examined.

IV.3.2 The Returns to Language in the Quebec Labour Market: the Interactive Effects.

To examine the hypothesis that the earnings equations of the four linguistic skills groups differ from one another, one can calculate the appropriate equations and use a Chow-test to examine the existence of significant differences between the sets of coefficients. Tables H-1 and H-2 present the appropriate regression results and Table H-3 presents the F-statistics computed for the Chow-test; these tables are found in Appendix H.

The results of Table H-3 indicates that all of the various pairs of sets of coefficients are significantly different from one another at the ninety-nine per cent confidence level save for the unilingual Anglophone / bilingual pair. These are results similar to those found using dichotomous variables to acount for language skills.

Looking at the results of Tables H-1 and H-2, one can see that all the equations are highly significant, as the F-statistic shows, and that the various coefficients all have the expected signs and relative magnitudes except for the "High School 12-13" coefficient for unilingual Francophones in Montreal. This is a result similar to the one found for Quebec and reported in Table 4.7 and its causes could be similar.

A perusal of Tables H-1 and H-2 seems to indicate that the years of experience of unilingual Anglophones are worth more than those endowed with other linguistic skills in both Quebec and Montreal. To better ascertain, however, which coefficients differ from one another, various equations with various sets of interactive variables were estimated. The results from two such estimations with language / education and language / experience interactive variables are presented in Table H-4. They, rather than others, were presented since they are fairly indicative of the types of results obtained which are:

- that interactive region / language and weeks worked / language variables do not significantly contribute to differences in earnings between language groups,

- that interactive experience / language variables indicate a different experience-earnings profile for unilingual Anglophones in both Quebec and Montreal and for bilingual Anglophones in Quebec from the experience earnings profile of unilingual Francophones,

- that interactive education / language variables indicate that it is those with at least a grade twelve education who see their education interact with their language skills and increase their earnings.

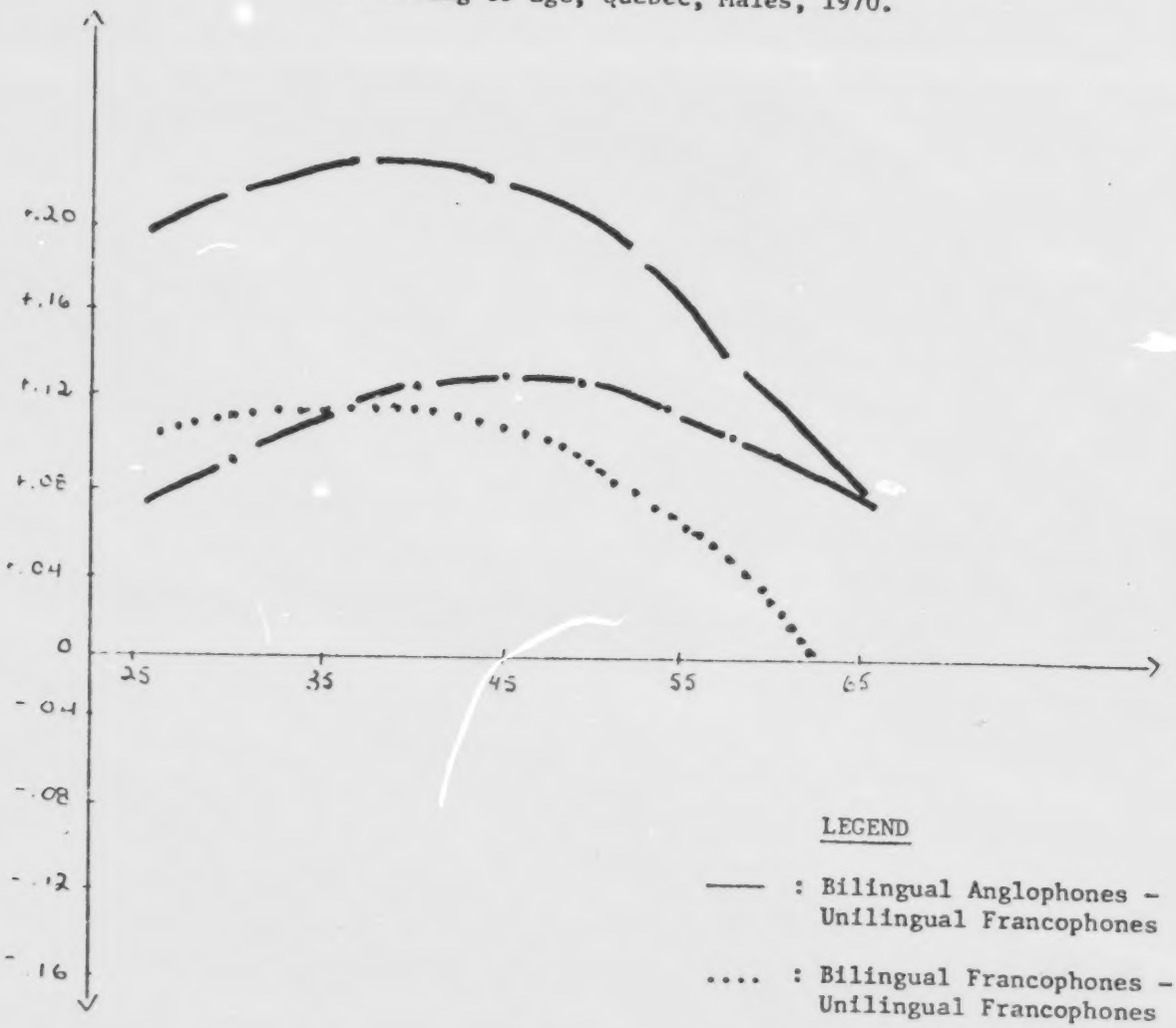
These conclusions are arrived at after examining the statistical significance of the various coefficients of the interactive variables.

Another way of gaining an understanding of the differences in returns to experience and education is to compute separate regressions for various age and education subgroups. This was done and the results for various age groups are reported in Tables H-5 and H-6, with the differences between the language coefficients examined in Table H-7. The differences between some of the language coefficients were plotted across the four age groups and are presented in figures 4.1 and 4.2

FIGURE 4.1

Differences in returns to language

according to age, Quebec, Males, 1970.



LEGEND

——— : Bilingual Anglophones – Unilingual Francophones

.... : Bilingual Francophones – Unilingual Francophones

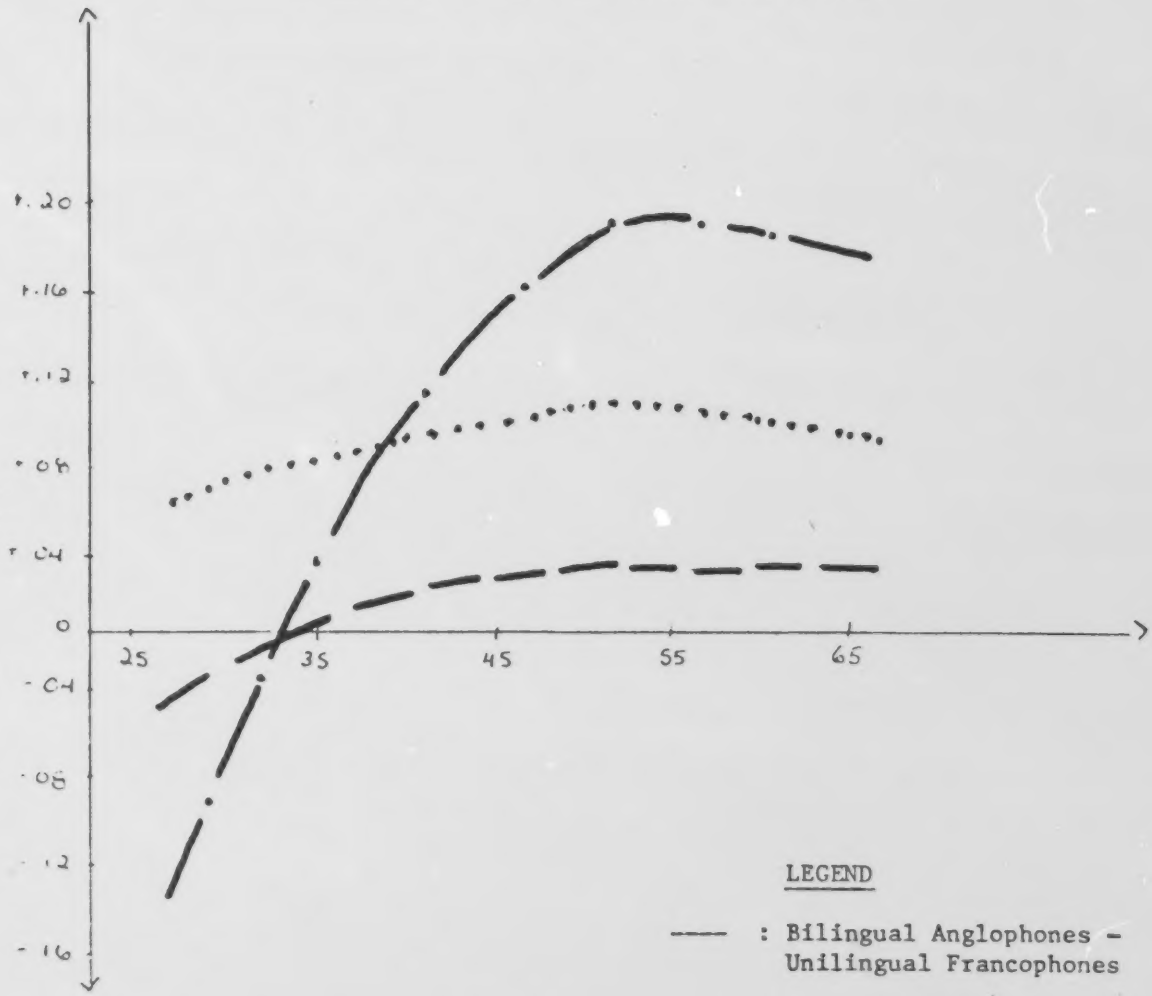
-.-. : Bilingual Anglophones – Bilingual Francophones

Sources: Tables H-5 and H-7

FIGURE 4.2

Differences in returns to language

according to age, Montreal, Males, 1970.



LEGEND

——— : Bilingual Anglophones – Unilingual Francophones

.... : Bilingual Francophones – Unilingual Francophones

-.-. : Bilingual Anglophones – Bilingual Francophones

Sources: Tables H-6 and H-7

In both Quebec and Montreal, the equations are significant overall. Looking first at the non-language variables one can see that:

- the Region variables are significant and of the expected signs and relative magnitudes,

- the Weeks Worked variables are also of the expected signs and relative magnitudes,

- the Experience variables are not significant except for the age group 25-34. This is a reasonable result, as is the negative and significant sign on the experience variable in the 55-64 group in Montreal, given the high constant of that regression,

- the Education variables are significant and of the expected signs and relative magnitudes, except for the 55-64 group in Montreal with the high value of the constant term probably being the cause of that pattern. It should be also pointed out that the gains due to a given education level tend to decrese with age. This could be the results of increasing education requirements through time for a given job. As to the results for the 55-64 group in Quebec, they may be the results of high rewards for those who continued their education through the depression years of the thirties.

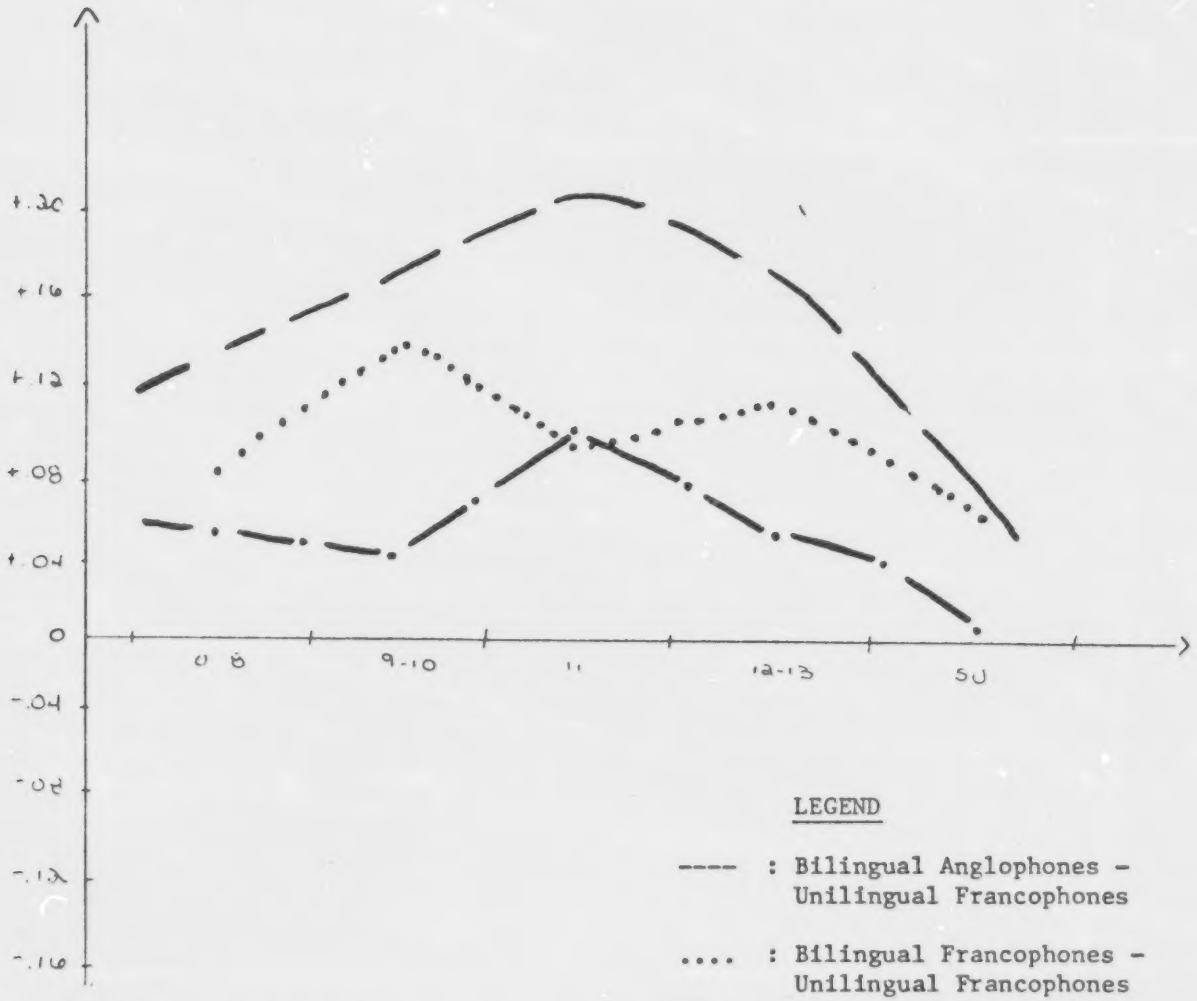
Looking at the language variables, one finds that H1 (i) is supported in most age groups, since Anglophones and bilingual Francophones earn significantly more than unilingual Francophones for twenty-one of the twenty-four coefficients. One also finds that the H1 (ii) hypothesis which states that Anglophones earn more than bilingual Francophones is supported for all groups, save the 25-34, in both Quebec and Montreal with one coefficient significant only at the ninety per cent level. It is interesting to note the results in Montreal for the 25-34 group, where bilingual Anglophones earn significantly less than bilingual Francophones. It could be that firms are, at least for bilingual positions, practicing reverse discrimination, possibly because of the changes that have been taken place in Quebec since 1960. Finally it should be pointed out that the relative gains from being an Anglophone first increase then decrease with age.

The results for various education groups are presented in Table H-8 and H-9 with the differences between the language coefficients examined in Table H-10. The differences between some of the language coefficients were plotted across the five education groups and are presented in Figures 4.3 and 4.4

FIGURE 4.3

Differences in returns to language

according to Education, Quebec, Males, 1970.



LEGEND

---- : Bilingual Anglophones - Unilingual Francophones

.... : Bilingual Francophones - Unilingual Francophones

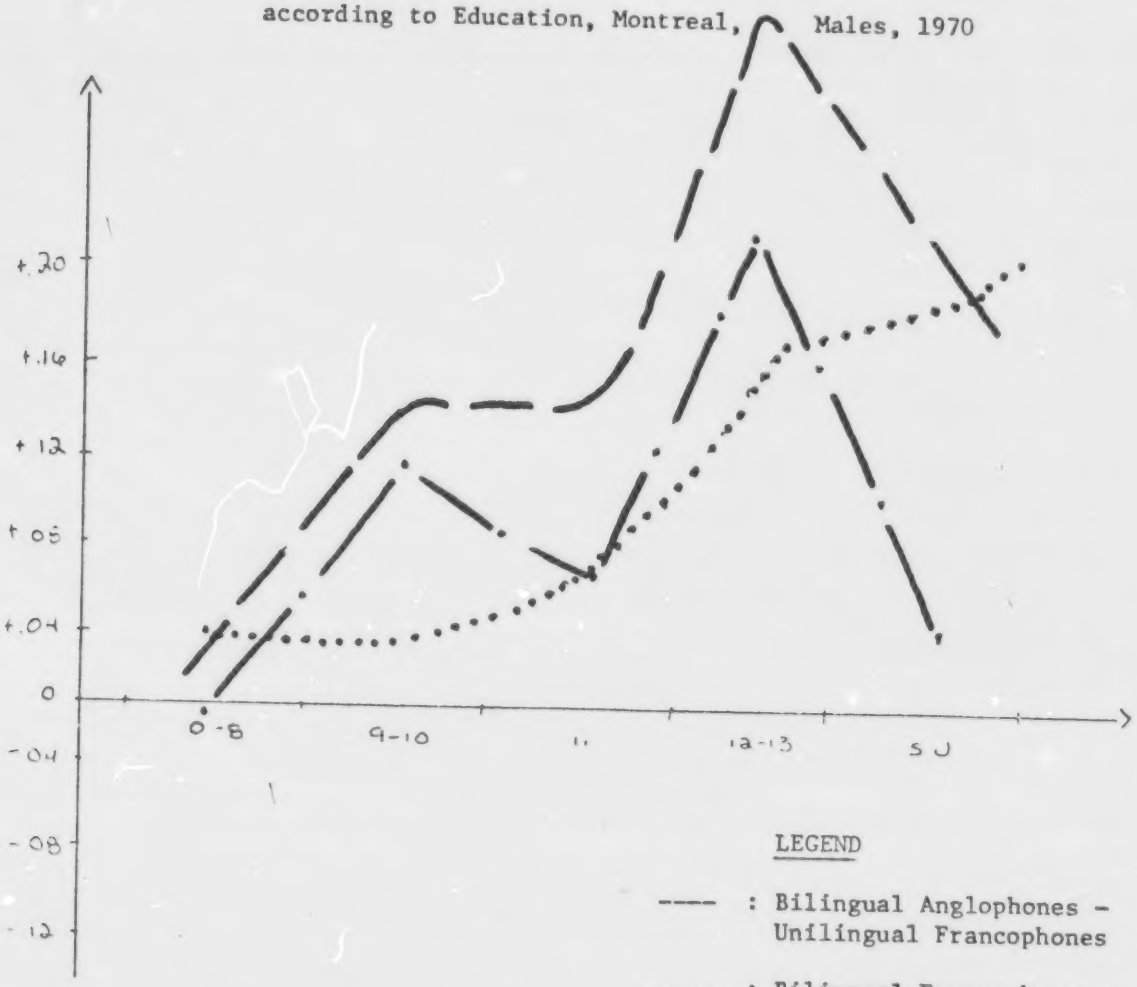
-.-. : Bilingual Anglophones - Bilingual Francophones

Sources: Tables H-8 and H-10

FIGURE 4.4

Differences in returns to language

according to Education, Montreal, Males, 1970



Sources: Tables H-9 and H-10

All the equations are significant overall. Looking at the non-language variables first, one finds that

- the Region variables are not significant except for individuals with little education; one possible explanation is that better educated individuals are more mobile and by this prevent the appearance of differences in earnings across regions,

- the Weeks Worked variables are significant and of the expected signs and relative magnitudes,

- the Experience variables are of the expected signs and relative magnitude and are significant.

It is interesting to note that Lacroix and Lemelin examined the earnings of the Highly Qualified Manpower of Canada and found for males an experience coefficient varying from .064 to .066 and an experience squared coefficient of -.0012 using various specifications of earnings equation with the logarithm of earnings as their dependent variable (Lacroix and Lemelin, 1977, p. 14). These are very similar to the results for individuals with Some university which are .067 and -.0013 in the case of Quebec and .066 and -.0012 in the case of Montreal.

Looking at the language coefficients one finds that

- in the zero to eight years of schooling group, bilingual individuals in Quebec earn more than unilingual individuals; a possible explanation is that language skills are being used as substitutes for education. In the case of Montreal, unilingual Anglophones earn more than unilingual Francophones, possibly because of their ethnicity,

- in the nine or ten years of schooling group in Quebec, the H1 (i) hypothesis cannot be rejected. For Montreal, one finds that bilingual Anglophones earn more than all other groups, lending some support to the H1 (iii) hypothesis,

- for individuals with eleven years of schooling the H1 (i) hypothesis is supported in Quebec while language has no significant impact on earnings in Montreal,

- for individuals with twelve or thirteen years of education, one finds that the H1 (i) hypothesis is supported by the evidence for both Quebec and Montreal. Furthermore the H1 (ii) hypothesis is supported by the evidence in the Montreal area,

- finally for individuals with Some university education, the H1 (ii) hypothesis cannot be rejected for the Montreal area, while in Quebec unilingual Anglophones earn significantly more than all other linguistic skills groups. This could possibly be explained by the facts that outside Montreal, English is not needed to gain access to better paying jobs, for example in the Quebec civil service and that most unilingual Anglophones with that education in Quebec reside in Montreal.

Taking an overall view, one notes that the relative returns to being an Anglophone or a bilingual Francophone increase with education till one joins the "Some university" group where they level off or decrease somewhat. One possible explanation of this is that university education is a partial substitute to knowing English for Francophones since it gives them easier access to the public and quasi-public sector.

To summarize, there seems to be some interaction between language and

education and between language and experience in determining the earnings of individuals. This will be taken into account when attempts are made in Chapter V to separate out the human capital impact and the ethnic impact of language on earnings. This cannot be taken into account, however, in the analysis of industry and occupation subgroups since some variables would lack a sufficient number of degrees of freedom.

IV.3.3 The Industry Specific Returns to Language in the Quebec Labour Market

It was argued in Chapter III that in addition to a general set of testable hypotheses, valid for the entire Quebec labour market (H1), an additional set of hypotheses could be made with respect to specific industries (H2). To examine this set of hypotheses, industry specific regressions were estimated; these regressions do not include interactive variables since sufficient degrees of freedom would not be available, especially the Montreal area. Table H-11 and H-12 present the regression results for Quebec and Montreal respectively and Table H-13 presents the differences between the language coefficients.

In the case of both Quebec and Montreal, all the equations are significant overall, as the F-statistics show. Looking first at the non-language coefficients, one finds that:

- the Region variables are not always significant but that the relative magnitude of the coefficients are raisonable. For example, in the Resources industry it is not surprising that those working in the larger urban areas, where head offices operations are likely to be located, should earn more than those working in smaller urban centers where the mining or logging operations are located.

- The Weeks Worked variables are significant in all of the equations and of the expected signs and relative magnitudes.

- The Experience variables are also significant in all of the equations and of the expected signs and relative magnitudes.

- The Education variables are significant in most of the equations and exhibit the expected patterns of relative magnitudes. In the Construction sector, education has less of a positive impact on earnings with two coefficients in both Quebec and Montreal not being significantly different from zero: this is quite reasonable, however, given the rather physical nature of the work in that industry.

Turning to the language coefficients, it seems useful to examine them on an industry-by-industry basis.

- In the Resources sector, one finds that a knowledge of English does not increase the earnings of workers which means that H1 does not hold at all. This is somewhat surprising given the degree of non-Francophone ownership in that sector but could be explained by the location of the natural resources. They are found outside Montreal in areas whose population is made up almost exclusively of Francophones. It is possible that firms operating in that sector have decided, given the location of the resources and the language skills of the readily available labour, to use French as their language of work.

- In the Manufacturing sector, one finds, in both Quebec and Montreal, that Anglophones, bilingual or not, and bilingual Francophones earn significantly more than unilingual Francophones. Hence, H1 (i) is supported in this sector.

Also the differences in earnings between Anglophones and bilingual Francophones are all significant at the eighty-five per cent level, but not at the ninety-five percent level, lending some support to the H1 (ii) hypothesis. So, in the Manufacturing sector knowing English increases one's earnings, as does being an Anglophone.

- In the Transportation / Communication sector, one finds that H1 (i) is again supported by the evidence for the Montreal area but that in Quebec as a whole bilingual Anglophones do not significantly earn more than unilingual Francophones. For the whole of Quebec, unilingual Anglophones earn more than bilingual Anglophones, a contradiction of H1 (iii), and more than bilingual Francophones, a fact which lends support to H1 (ii). In the Montreal area, unilingual Anglophones earn more than bilingual Francophones and bilingual Anglophones also do so, if one accepts a critical level of ninety per cent; this lends support to H1 (ii). The lack of a difference between the earnings of bilingual Anglophones and unilingual Francophones in Quebec may indicate that the former are hired because they speak French and not because they speak English.

- In the Finance sector, one finds that the H1 (i) hypothesis is again supported by the evidence for Montreal but that, for the whole of Quebec, H1 (i) does not hold since while unilingual Anglophones earn more than unilingual Francophones, bilingual employees do not earn more than unilingual Francophones. Indeed, in the case of Montreal, all Anglophones earn significantly more than unilingual Francophones.

Taking into account that the whole of Quebec comprehends Montreal, it appears that outside Montreal knowing English does not increase the earnings of those working in that sector. However, in Montreal knowing English increases one's earnings. This is consistent with the H2 (ii) and H2 (iii) hypotheses which state that in anglophone owned sectors and in sectors selling goods and services outside Quebec, knowing English will increase the earnings of employees. Since many Canadian financial institutions have their head offices in Montreal, such head offices exporting services to the rest of Canada, and since most of those institutions are not owned by Francophones, the results found in the Finance sector lend some support to the H2 (ii) and H2 (iii) hypotheses, especially since outside Montreal the main financial institution is the Mouvement Desjardins, a group of cooperative credit unions owned by Francophones.

- In the Construction sector, the H1 (i) hypothesis is not verified and the H1 (ii) hypothesis, that is that Anglophones earn more than bilingual Francophones, is verified only in Montreal if one accepts a critical level of ninety per cent for the difference between unilingual Anglophones and bilingual Francophones. One possible explanation of those results is that most anglophone construction firms are located in Montreal, with few of them operating in the remainder of Quebec.

- In the Trade sector, in both Quebec and Montreal, one finds that unilingual Anglophones do not earn more than unilingual Francophones but that bilingual individuals do. Furthermore, in Quebec, bilingual Anglophones earn more than unilingual Anglophones while in the Montreal area they don't. This lends partial support to the H2 (i) hypothesis which states that bilingual individuals would earn more than unilingual individuals in the Trade sector since they could serve both groups of customers in a bilingual society. It is interesting to compare the results of Quebec and Montreal since the linguistic make-up of the customers differs between them. It is not surprising that bilingual Anglophones

should have higher relative earnings in Quebec than in Montreal since they are more likely to find anglophone customers in Montreal than in Quebec. In the same vein, it is not surprising to see that the relative returns to bilingualism for Francophones are higher in Quebec than in Montreal since Anglophones can more easily find members of their own group to buy from in Montreal than in Quebec.

- In the Services sector, one finds that there is no evidence to support the H1 set of hypotheses. This could be explained in part by the nature of the industry (restaurants, drycleaners, and so on) where information does not play an important role in the production process and in part by the high Francophone ownership, a fact which lends some support to H2 (ii).

- In the Government sector, one finds that the H1 (i) hypothesis is supported in Quebec but not in Montreal; indeed, the evidence for Montreal lends support to the H2 (iv) hypothesis which states that, because of the way the various levels of governments are elected in Quebec and because of the resulting linguistic make-up of their employees, knowing English should not increase the earnings of those working in that sector. The contradictory evidence for Quebec could result from the fact that civil servants, who work in Ottawa, the "head office", where English is usually the language of work, live in the Hull area of Quebec.

To summarize, one notes that in those industries where francophone ownership is, high, that is Services, and, in some sense, Government, knowing English does not have a significant impact on earnings, the caveat as to the Government sector in Quebec aside. Indeed, the results in that sector lend some support to the H2 (iv) hypothesis. One also notes that in those sectors where anglophone ownership is high, one finds that knowing English has a positive impact on earnings. One exception is the Resource sector where the immobility of the natural resources and the mother tongue of the readily available labour weakens that relationship. However, those sectors where Anglophones ownership is high, that is Manufacturing, Transportation / Communication and Finance, are also the sectors which are export-oriented; it is, therefore, hard to distinguish between the support these results lend to the H2 (ii) and H2 (iii) hypotheses. Finally the evidence in the Trade sector lends good support to the H2 (i) hypothesis.

IV.3.4 The Occupation Specific Returns to Language in the Quebec Labour Market

It was argued in Chapter III that in addition to the general set of testable hypotheses (H1), an additional set of hypotheses (H3) could be made with respect to specific occupations. To examine these hypotheses, occupation-specific regressions were estimated for both Quebec and Montreal; as in the case of the regressions for industries, it was not possible to include interactive variables. Tables H-14 and H-15 present the results for Quebec and Montreal respectively and Table H-16 presents the differences between the language coefficients.

In the case of both Quebec and Montreal, all the equations are significant overall, as the F-statistics show. Looking first at the non-language coefficients, one finds that:

- the Region variables are not all significant; they are for what can be referred to as blue-collar workers that is Primary, Processing, Assembly,

Transportation, and Construction Workers and for Services. It would then seem that in jobs which are of a white-collar nature, that is Administration, Applied Sciences, Health/Teaching, Clerks, and Salespeople, earnings are the same in rural and urban areas, in small or big towns. In the case of the Health/Teaching employees this could be because they work for the same employer, the provincial Government, wherever they are located, while for those in Administration or Applied Sciences, this could be a result of a greater mobility that prevents the apparition of significant wage differentials across regions.

- The Weeks Worked variables are significant and of the expected signs and relative magnitudes except in two cases, both for Montreal; the 14-26 category is not different from zero for those working in Applied Sciences and the 27-39 category is smaller than the 14-26 category for Processing Workers. In both cases the number of individuals in the category is small, twenty and eleven, which may explain the results.

- The Experience variables are significant in all of the equations and of the expected signs and magnitudes.

- The Education variables are significant in most of the equations and of the expected signs and magnitudes. However, in the better white-collar jobs, that is Administration, Applied Sciences, and Health/Teaching, one finds in both Quebec and Montreal that an individual going from the reference level of schooling, that is zero to eight years of schooling, to the two levels immediately above, that is nine and ten years and eleven years will not see his earnings increased. One possible explanation is that what makes the difference in those occupations is schooling beyond the High school level; this could be particularly true in the Applied Sciences occupations where computing sciences or engineering degrees are sought or in the Health/Teaching occupations where a teaching degree or a nursing degree are often prerequisites to employment.

As to the language coefficients it seems, once more, appropriate to examine them for each subgroup.

- In the Administration occupations, the H1 (ii) hypothesis is supported since Anglophones, bilingual or not, earn significantly more than Francophones. The H1 (i) is supported in toto only in the case of Quebec. This dovetails well with the argument made above (4.3.1), that English is the language typically used for management in Quebec. In the Montreal area where there is a sufficient supply of Anglophones, knowing English is not sufficient for Francophones to increase significantly their earnings. In the case of Quebec as a whole where the supply of Anglophones is proportionally smaller than in Montreal, bilingual Francophones can use their English as a means of access to better paying management jobs.

The differences in demand are another possible explanation of the differences in the relative returns to Francophones in Quebec and Montreal of knowing English. One possibility is that head offices operations may require employees with Canada-wide experience for top management experience. Since francophone managers are less likely to have that experience than anglophone managers (7), they will not gain access to these jobs even if they know English. Another possibility is that discriminatory behaviour along ethnic lines brings about differences in the demand for Anglophones and Francophones in top management jobs; such discrimination may be pure or statistical.

- In the Applied Sciences occupation, one also finds that the H1 (i) hypothesis

is supported by the results for Quebec but not by those for Montreal. One also finds that unilingual Anglophones in Quebec and bilingual Anglophones in Montreal earn more than bilingual Francophones; this could possibly be explained by the presence of the engineering departments of canadian firms in Montreal, close to the head office. This lends support to the H1 (ii) hypothesis.

- In the Health/Teaching occupation, the H1 hypothesis does not hold since only bilingual Francophones earn more than unilingual Francophones; this lends support to the H3 (iii) which states that, because of the make-up of the population they serve and because of the institutions that employ them, those working in the Health/Teaching occupation should not see their earnings increase if they speak English.

- In the Clerks occupation, one finds that unilingual Anglophones earn no more than unilingual Francophones but that bilingual individuals do; they do not, however, earn more than unilingual Anglophones. Hence the H1 (i) hypothesis is not supported; indeed something akin to the H3 (i) hypothesis is supported. One possible explanation is that clerks are the interface between management, blue-collar workers, and, in some cases, customers and that they must handle both written and oral communications in both languages with all of these groups.

- In the Sales occupation, the H1 (i) hypothesis is supported by the evidence for both Quebec and Montreal. One also finds that bilingual Anglophones earn more than unilingual Anglophones in Quebec, a fact which lends support to the H3 (i) hypothesis which states that bilingual salespeople should earn more than unilingual members of their language group. In the Montreal area, the fact that bilingualism does not increase the earnings of Anglophones possibly indicates the impact of the availability of English-speaking customers in Montreal for anglophone salespeoples.

- In the Primary Workers occupation, one finds that the H1 (i) hypothesis does not hold; this result dovetails well with the results found in the Resources Sectors where knowing English did not increase the earnings of workers.

- In the case of Processing Workers, one finds that in Quebec bilingual workers earn more than unilingual Francophones but unilingual Anglophones do not. However, bilingual Anglophones earn significantly more than bilingual Francophones. This could possibly indicate that the ethnic origin has some impact on the earnings of individuals who have the same linguistic human capital; however, H1 (i) does not hold.

- In the case of Assembly Workers and in the case of Transportation Workers, the H1 (i) hypothesis is verified in Quebec but not in Montreal. This could possibly be the result of the smaller supply of Anglophones outside Montreal and of the need to fill some jobs with individuals who speak English.

- In the case of Construction Workers, the H1 (i) hypothesis is supported only in the case of Montreal, a result that dovetails well with the findings for the Construction Industry and can probably be attributed to the same causes.

- Finally in the case of those in Services Occupations, the results are similar to those found in the Service sectors with H1 (i) not being supported although bilingual Francophones do earn significantly more than unilingual Francophones in Quebec.

To summarize, the H3 set of hypotheses is lent support by the results found

above since individuals in Administration and Applied Sciences occupations see their earnings increase significantly if they are Anglophones, those in Health/Teaching do not, overall, see their earnings increase if they know English and those in Sales occupations benefit from bilingualism. The results for Administration and Applied Sciences are interesting and they could possibly be explained by some form of discrimination. As to the results for Salespeople, they confirm those found in the Trade industry.

To conclude, the results found in the chapter lend support to the hypothesis that knowing English increases the earnings of those working in Quebec and Montreal (H1 i). They also lend support to the hypothesis that Anglophones earn significantly more than Francophones (H1 ii). They lend no support whatsoever, however, to the hypothesis that bilingual Anglophones should earn more than their unilingual counterparts since they have more linguistic human capital (H1 iii); this could possibly imply that Anglophones have, or at least had, no monetary incentives to learn French. Finally, it was impossible to settle clearly if unilingual Anglophones earned more than bilingual Francophones since the situation varied across regions and across various subgroups. As to the set of hypotheses for industries (H2) and occupations (H3), they are given some support by the available evidence.

It now remains to examine the net contributions of language to earnings differences, comparing it to the gross differences described in Chapter III and to examine the parts that can be ascribed to human capital and ethnicity; this is done in Chapter V.

REFERENCES

(1) Let us note that in the Public Use Sample Tape, the actual earnings figure up to and including $75,000 is reported as such: above that amount Statistics Canada rounded the earnings to $75,000, and this is the amount attributed to those individuals. Let us also note that the last digit of the earnings amount has been deleted and systematically replaced by zero.

(2) In the Census questionnaire, individuals are not asked the number of weeks they worked but rather to indicate in which of the five categories used in Table 4.5 their number of weeks worked belongs in.

(3) No discussion of the quality of the data has been undertaken here, since it is felt that the information obtained from the Census is sufficiently good that measurement problems should not bias the principal results of this analysis.

(4) If experience is a continuous variable; if it was a dichotomous variable then the percentage change in earnings would be, taking language as an example, $e^{\beta}4 - 1$.

(5) At the ninety-five per cent confidence level: the * is used in similar tables throughout for the same purpose.

(6) The unconclusive nature of this discussion points out that the dynamics of language choices have not been fully modeled yet.

(7) According to calculations made using the 1/100 sample, sixty-four per cent of unilingual anglophone managers in Montreal completed their high school outside Quebec.

CHAPTER V

NET EARNINGS DIFFERENCES BY LANGUAGE GROUPS: THE IMPACT OF HUMAN CAPITAL AND ETHNICITY

In the discussion of the gross earnings differentials between language groups reported in Chapter III and Appendix A, it was pointed out that these differentials should not be used as a measure of the impact of language on earnings since these results did not control for differences in non-language personal characteristics, such as education and experience, and for differences in other characteristics such as the number of weeks worked. However, the regression results reported in Chapter IV provide a measure of the impact of language on earnings with some of the other relevant personal characteristics having been controlled for. Hence, in this chapter these results will be used to permit the following two items: one of them is the comparison of the gross earnings differentials between language groups with the calculated net differentials; this will bring together the results of Chapter III and of Chapter IV. The other is the breakdown, approximate it is granted, of the net impact of language between a human capital effect and an ethnicity effect; this brings together a technique outlined in Chapter II and the regression results of Chapter IV and yields an upper-bound estimate of discrimination in the Quebec labour market.

So, in the first part of the chapter, the differences between gross and net earnings differentials across language groups and the differences between the impact of the human capital effect and the ethnicity effect of language on earnings are examined for the Quebec and Montreal labour market. This is done first using the results of the regression analysis in which the effect of language is measured through an intercept term; these results were reported in Table 4.9. Secondly, the differences in earnings across language groups are examined using the results of regression equations estimated for the four language skills groups in both Quebec and Montreal: these results were reported in Tables H-1 and H-2.

In the second part of the chapter, a similar discussion is carried out for age, education and occupation subgroups. Finally in the third part of the chapter, the validity of the results when the human capital and ethnicity effects are seperated out is discussed and the results of the first part of the chapter are compared to those obtained in similar studies.

V.1 Net Earnings Differences, Human Capital Effects and Ethnicity Effects: Quebec and Montreal

In the discussion that follows it must be remembered that one is comparing Anglophones and Francophones in Quebec in 1970 and that the results thus obtained do not necessarily generalize to other regions of Canada or other time periods (1). In particular, one should note that Anglophones who are living in Quebec in 1970 have chosen to do so , in part because of the earnings opportunities open to them; the linguistic make-up of the North-American continent means that there are no language barriers to their leaving Quebec and working somewhere else in Canada. On the other hand, Francophones living in Quebec must overcome a language barrier if they wish to settle somewhere else in Canada, its importance depending on their language skills. Hence they may, ceteris paribus, have to accept lower earnings than Anglophones, a partial explanation of earnings differences.

V.1.1. Net Earnings Differentials: The Intercept Effets

The gross differences in earnings between language groups, discussed in Chapter III, and the net differences obtained through the use of dichotomous variables are set down in Table 5.1 for both Quebec and Montreal.

Table 5.1

Gross and Net Earnings Differences,
Quebec and Montreal, 1970, Males.

	Percentage gain over an Unilingual Francophone			
	Quebec		Montreal	
	Gross	Net	Gross	Net
Unilingual Anglophone	69	13,7	66	11,7
Bilingual Anglophone	61	14,6	62	11,9
Bilingual Francophone	37	10,4	35	5,8

Source: Tables A-1, A-9, 4.9

Looking at the results in Table 5.1, one notes that the gross earnings differences between unilingual Francophones and English-speaking workers are three to six times higher than the net earnings differentials. This indicates that differences in education, job experience, weeks worked, and region of residence are important factors in explaining the differences in earnings between language groups in the whole of Quebec and in Montreal.

These net differences in earnings between language groups do not indicate, however, the relative contribution of the human capital and of the ethnicity that language embodies. Pure human capital effects can be observed when a comparison is made of individuals of the same language group who know or do not

know a second language. Doing this, one finds that:

- for Anglophones, being bilingual has no significant positive impact, as shown in Table 4.10, on their earnings in the whole of Quebec or in Montreal. Looking at the coefficients carefully, however, one is led to suspect that there probably is a positive monetary return to knowing French for Anglophones living in Quebec outside Montreal but it is impossible because of data limitations to measure it. Such a result would not be surprising, however, given the make-up of the population (2) and the widespread use of French as a language of work outside Montreal (Carlos, 1973). As to the lack of monetary returns for Montreal Anglophones to knowing French, one possible explanation is the presence of head offices of Canadian companies in that city. Whatever the reason, it remains that there is little market inducement for most Anglophones to learn French in Quebec;

- for Francophones, being bilingual has a significant positive impact on their earnings as shown in Table 4.10, in both Quebec and Montreal. Various explanations have been offered in the preceding chapters as to why this is so, ranging from the ownership of industries to the language of the external marketplace, and they will not be discussed here again. Whatever the reason, it remains that there is a positive market inducement for Francophones to learn English in Quebec.

This discussion of the returns to language as human capital was reasonably straightforward since it was possible to isolate, by holding it constant, the effect of ethnicity and to look at the effect of specific linguistic human capital on the earnings of individuals in Quebec. On the other hand, if one where to compare unilingual Francophones and unilingual Anglophones, it would not be possible to sort out the positive impact on earnings of knowing English (the human capital effect) and of being of English mother tongue (the ethnicity effect). The only way available to us of isolating the human capital effect and the ethnicity effect of English on the earnings of an Anglophone is a two-step procedure; first, one compares the earnings of bilingual Francophones to unilingual Francophones and ascribes the difference, as argued above, to the acquisition of English as human capital. Secondly, one compares the earnings of bilingual Francophones and bilingual Anglophones and ascribes the difference to ethnicity. As argued earlier (H1 ii) this is probably an overestimate of the impact of ethnicity on earnings since the knowledge of English by Anglophones is better than the knowledge of English by bilingual Francophones. The results of calculations along those lines are presented in Table 5.2.

Table 5.2

The returns to Ethnicity and Human Capital, Percentage Share, all Males, 1970.

	Quebec	Montreal
	Final Sample	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	17,0	9,3
Ethnicity:	6,9	9,8
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	71,2	48,7
Ethnicity:	28,8	51,3

NOTE: The formulas used to calculate the gross and net returns to knowing English (human capital) and being of English mother tongue (ethnicity) are written down below.

	Gross Returns		Net Returns	
Linguistic Human Capital:	$\frac{\text{Net B.F.}}{\text{Gross B.A.}}$	(1)	$\frac{\text{Net B.F.}}{\text{Net B.A.}}$	(3)
Ethnicity:	$\frac{\text{Net B.A - Net B.F.}}{\text{Gross B.A.}}$	(2)	$1 - \frac{\text{Net B.F.}}{\text{Net B.A}}$	(4)

where B.A. stands for Bilingual Anglophones, B.F. stands for Bilingual Francophones, and Gross and Net refer to the columns of the appropriate "Gross and Net Earnings Differences" table. The formula outlined above is used in all similar tables; a * indicates that the results for unilingual Anglophones were substituted for those of bilingual Anglophones in the appropriate formula.

Source: Table 5.1

Examining the results of Table 5.2, one finds that the ethnic origin of Anglophones would explain twenty-nine per cent of their net earnings premium over unilingual Francophones in the whole of Quebec and fifty-one per cent in Montreal. Using the same approach, one finds that the ethnic origin of Anglophones would explain seven per cent of their gross earnings premium over unilingual Francophones in Quebec and ten per cent in Montreal. These differences in earnings that appear to be linked to ethnicity could be the result of different information networks for Anglophones and Francophones in Quebec, as Migué (1970) has argued. It could also be the result of discrimination, pure or statistical (3). In the case of pure discrimination, one should note that employers may not prac-

tice true economic discrimination which is "... said to exist when workers do not receive pay or remuneration commensurate with their productivity... " (Aigner and Cain, 1976, p. 177) but rather "... occupational (job-typing) discrimination..." (Christensen and Bernard, 1974, p. 388), something akin to Becker's segregation (1957) but not as extreme. Indeed in the United States it has been found that "... the relative absence of wage rate differences by race suggests that the observed income differences by race may be due primarily to adverse employment distributions" (Strauss and Horvath, 1976, p. 97). Since in this thesis the focus is on earnings differences, the presence of occupational discrimination will not be formally examined.

On the other hand, the net differences in earnings could be the result of differences between Anglophones and Francophones in personal attributes such as intelligence or work motivation that were not captured by the control variables used in the regression analysis to net out the effect of language on earnings. This will be discussed at some length in the last part of this chapter once the remainder of the evidence on net earnings differences has been presented.

V.1.2 Net Earnings Differentials: The Differing Equations Results.

As was discussed above, another way of examining the impact of language on earnings is to estimate earnings equations for each linguistic skills groups for both Quebec and Montreal. That done, one can insert in the equation appropriate values for the various independent variables and obtain earnings figures for each group. This was done for both Quebec and Montreal, using the equations reported in Tables H-1 and H-2. It was assumed that the members of the various linguistic skills groups had all worked forty-nine weeks or more in 1970. This was done to simplify the comparison but it is a reasonable assumption as shown by Tables C-5 and C-11. Furthermore, it was assumed in the case of Quebec that the members of the various linguistic skills groups all lived in an urban area with a population greater than 30,000. These set values were then plugged back in the earnings equations of Tables H-1 and H-2 along with a range of education and experience values to calculate the earnings of members of the various linguistic skills groups. Four experience levels and the five possible education levels were used so as to better assess the impact of these variables on the earnings differences between linguistic skills groups.

The earnings obtained by plugging back values of the independent variables in the earnings equations reported in Tables H-1 and H-2 were used to calculate earnings ratios. Three such ratios were calculated: unilingual Anglophones/ unilingual Francophones, bilingual Anglophones/ unilingual Francophones, and bilingual Francophones/ unilingual Francophones. These ratios minus one are reported in Table 5.3.

Table 5.3

Net Earnings Differences, Earnings Equations by Linguistic Skills Groups, Quebec and Montreal, 1970, Males, Percentage

Years of Job Experience	Education Level	Quebec			Montreal		
		UA/UF	BA/UF	BF/UF	UA/UF	BA/UF	BF/UF
10	Primary 0-8	1,0	20,6	19,3	0,7	-6,0	18,6
10	High School 9-10	14,6	21,5	20,5	-8,9	0,2	18,0
10	High School 11	19,4	28,9	18,0	11,1	17,5	22,9
10	High School 12-13	25,1	27,9	21,0	36,6	50,4	35,0
10	Some University	22,8	15,3	12,0	27,0	23,2	26,5
20	Primary 0-8	7,6	24,4	14,6	11,7	-5,6	13,7
20	High School 9-10	22,0	25,3	15,7	0,9	16,6	13,0
20	High School 11	27,2	32,9	13,3	23,2	18,0	17,8
20	High School 12-13	33,2	31,9	16,2	51,4	51,1	29,3
20	Some University	30,8	18,8	7,5	40,9	23,7	21,2
30	Primary 0-8	9,2	26,2	11,6	19,4	-0,2	9,8
30	High School 9-10	23,8	27,2	12,6	7,9	23,2	9,2
30	High School 11	29,1	34,8	10,3	31,8	24,7	13,8
30	High School 12-13	35,2	33,9	13,1	62,6	60,3	25,4
30	Some University	32,7	20,6	4,7	50,6	30,7	17,1
40	Primary 0-8	-5,2	26,0	10,2	23,2	10,7	7,0
40	High School 9-10	7,5	27,0	11,2	11,4	36,8	6,4
40	High School 11	12,0	34,4	8,9	35,9	38,4	10,8
40	High School 12-13	17,4	33,7	11,7	67,1	77,3	21,7
40	Some University	15,2	20,4	3,4	55.4	44,6	14,1

Note: UA stands for Unilingual Anglophones, BA for Bilingual Anglophones, UF for Unilingual Francophones and BF for Bilingual Francophones.

Examining the results of Table 5.3 one finds, for a given level of schooling, that:

- in Quebec, the difference between the earnings of Anglophones and those of unilingual Francophones first increase as individuals gain more job experience, reaches a peak around thirty years of experience then declines. In the case of Francophones, however, the monetary returns of knowing English decrease as their job experience increases;

- in Montreal, the difference between the earnings of Anglophones and those of unilingual Francophones increases over the first forty years of job experience. For Francophones, however, the same pattern that prevailed in Quebec holds.

One also finds, for a given level of experience, that:

- in Quebec, the spread between the earnings of unilingual Anglophones and bilingual Francophones on one hand, and unilingual Francophones on the other, reaches a peak for those individuals at the "High School 12-13" level of schooling. For bilingual Anglophones, however, the peak is reached at the "High School 11" level of schooling;

- in Montreal, the difference between the earnings of Anglophones and bilingual Francophones on one hand, and unilingual Francophones on the other, reaches a peak at the "High School 12-13" level of schooling.

The results presented in Table 5.3 are similar in the main with those found in Table 5.1; Anglophones earn more in almost all cases than bilingual Francophones who in turn earn more than unilingual Francophones. However, while the technique used to obtain the equations upon which the results of Table 5.3 are based allow us to state if two equations are significantly different from one another, it does not allow us to examine if, at a given age and education level, the earnings of say a bilingual Anglophone are significantly higher than those of an unilingual Francophone, as was done in Table 5.1, since the necessary statistical information is missing. Hence it is not possible using the results of Table 5.3 to separate out the human capital and ethnicity effects.

V.2 Net Earnings Differences: Age, Education, and Occupation Subgroups

In this section the net earnings differences between Anglophones and bilingual Francophones on one hand, and unilingual Francophones on the other are examined for age, education and occupation subgroups. The regression equations used allow us to examine if there are significant differences between the earnings of members of various language groups and to separate them out between human capital and ethnicity effects.

V.2.1 Net Earnings Differences: Age and Education Subgroups

Tables I-1 and I-2 present the gross and net earnings differences between language groups for various age and education subgroups. The results are obtained using the age and education specific regressions; this allows us to test for the significance of the differences in earnings observed between individuals endowed with different language skills. It also allows us to apportion out the human capital and ethnicity effects; these results are found in Tables I-3 and I-4.

The results presented in Tables I-1 and I-2 are similar to those found in

Table 5.3. For example, one notes that the earnings difference between unilingual Anglophones and their francophone counterparts peaks in the 45-54 group in Quebec and the 55-64 group in Montreal. Since the individuals in these age groups are likely to have respectively about thirty and forty years of experience, one can see that the results in Table 5.3 are of the same order as those in Table I-1. Another example is that the difference in earnings between bilingual Francophones and their unilingual counterparts follows about the same path in both Table I-1 and Table 5.3.

Because of the similarity of results, a discussion of the observed patterns will be carried out only for Tables I-1 and I-2. This discussion will refer to arguments already used in discussing some of the regression results but it is useful to note them in the light of the discussion of differences between the returns to human capital and to ethnicity.

Looking first at the evolution of earnings differences across age groups, one finds that:

- in Montreal, Anglophones earn significantly more, as shown in Table H-7, than Francophones, bilingual or not, aged from thirty-five to sixty-five. This positive monetary return to being of English ethnicity could possibly be explained by the presence in Montreal of head offices of Canadian companies. These companies would, if they strived for linguistic balance amongst their top management, hire no more than thirty per cent of Francophones since this is about their proportion in the population of Canada. Since these jobs are usually better paying than those found in the other establishments that the firm maintains in Quebec, this would lead to an earnings differential in favor of Anglophones. This differential would increase as one moves up from one age group to another since top-level jobs usually go to experienced personnel. Furthermore, Francophones could be even less than thirty per cent of the executives in head office operations if these firms discriminate against them, in a pure or statistical sense, if they use a different information network to recruit their executives than the one Francophones have access to, or if they require Canada-wide experience, something Francophones usually lack (Chambre de Commerce, 1975);

- in Quebec, the pattern is similar to the one found in Montreal but the difference between Anglophones and unilingual Francophones goes down when one moves from the 45-54 to the 55-64 age group. This could be because unilingual Francophones have an easier access to top-level management jobs outside Montreal than inside it. This could be the result of the fact that French is the language of work at all levels of the civil service in Quebec;

- in both Quebec and Montreal, bilingual Francophones earn about ten per cent more than their unilingual counterparts except in the 55-64 group where their net earnings premium is zero. This result is not exactly the same as the one found in Table 5.2 where it was found that the premium to Francophones for bilingualism decreased as they gained more and more experience. There are various possible explanations to the lower returns to knowing English for Francophones as they grow older. One of them is that, for a given cohort of individuals, employers use English ethnicity rather than knowledge of English as a prerequisite to well-paid jobs, the more so as the cohort ages. As a result, knowing English does not give Francophones access to well-paid jobs since being an Anglophone is a prerequisite.

A second possibility is that ethnic discrimination was stronger in Quebec thirty or forty years ago than it is now. This means that Francophones starting

to work then could not as easily make use of their knowledge of English to gain access to better jobs as they can now, and that this reflects itself in their earnings at the end of their career. A third possibility is that the usage of English expected from Francophones has increased through time as they have entered more and more in contact with English-speaking firms.

It is not, unfortunately, possible to sort out which explanation is the most relevant because of lack of information. It would have been particularly interesting to examine if discrimination, should it be present, has decreased through time but this is not feasible here.

Turning now to the differences in earnings differentials across education groups, one finds that:

- in Montreal, knowing English is not an important contributor to earnings for those with less than a grade twelve. In Quebec, however, knowing English adds to one's earnings at levels of schooling lower than grade twelve. One possible explanation could be the relative scarcity of lower-level employees who can speak English outside Montreal.

- in both Montreal and Quebec, the peak in earnings differences between those who know English and those who don't is reached at the grade twelve-thirteen level with the differences decreasing somewhat for those with some university training. As argued before, one possible explanation of this is that university training gives access to well-paid public sector jobs to unilingual Francophones.

This concludes the discussion of the net returns to language across age and education groups. As expected, some variations in the net returns appear but overall the pattern of Anglophones earning more than bilingual Francophones, who in turn earn more than unilingual Francophones, is maintained.

V.2.2 The Net Returns to Language: Occupation Subgroups

In the discussion carried out above, it was argued that part of the net returns to English in various age and education subgroups could be explained by some form of priviledged access to some occupations. Hence, it seems useful to examine the net returns to language by occupations, using the admittedly broad occupational categories available to us and the results of regressions estimated for each category. Both gross and net earnings differences are presented in Table I-5; the latter are broken down in human capital and ethnicity effects, and the results presented in Table I-6.

Looking at the results of Table I-5, one finds that:

- in both Quebec and Montreal, anglophone administrators earn significantly more than Francophones, bilingual or not, as shown in Table H-17. Various arguments have been put forward to explain this, such as the location of Canadian head offices in Montreal and the necessity of knowing English in some jobs because of their nature; they will not be discussed here in details. One can still note that ethnicity seems to explain about fifty per cent of the differences in earnings between bilingual Anglophones and unilingual Francophones in both Montreal and Quebec;

- in Montreal, Anglophones in Applied Sciences occupations earn more than unilingual Francophones while in Quebec this is true only of unilingual Anglophones, as Table H-17 shows. Once more the presence of head offices in Montreal could explain these results;

- in the Health/Teaching occupations, in the blue-collar occupations and in Service occupations one finds that being of English ethnic origin has no significant positive impact on the earnings of individuals; indeed in most cases, knowing English does not increase the earnings of individuals.

- in the case of Clerks, one finds that in both Montreal and Quebec English ethnicity does not contribute significantly to the earnings of individuals; what matters is bilingualism;

- finally, in the case of salespeoples, one finds that only in Quebec do Anglophones, if they are bilingual, earn more than bilingual Francophones.

Overall these results show that ethnicity matters for the jobs with the greatest decision-making power or prestige attached to them, that being bilingual matters for lower-level white collar jobs and that for blue-collar workers language is not as important as a determinant of earnings.

V.3 The Net Effect of Language on Earnings: Summing up

At the beginning of this chapter, it was pointed out that the method used to allocate the impact of language on earnings either to human capital effects or to ethnicity effects could be criticized as neglecting other relevant factors; this is discussed here. That done, the results obtained in the case of Quebec are compared to the available evidence for other labour markets.

Three characteristics whose effect on earnings could possibly be captured by the language variables are intelligence, health, and attitudes towards work and monetary rewards.

With respect to differences in intelligence it is interesting to recall the comment by Armstrong that "One individual may be more effective or more productive than another for a number of reasons. In the first place he may have higher native intelligence... this factor... is not likely to explain the difference between two large groups of people with such a similar racial background as those in Ontario and Quebec" (1970, p. 12). This statement, however, was not substantiated by Armstrong. A discussion with Professor W.E. Lambert, of the Psychology Department of Mc Gill University in Montreal, led us to conclude that it is very hard to compare results of intelligence test, but that it is likely that no substantial differences exist between the level of intelligence of Anglophones and Francophones in Quebec (4).

This admittedly limited evidence nonetheless would seem to shift the burden of the proof to those willing to argue that Anglophones are inherently more intelligent than Francophones.

Health could also be a cause of differences in earnings between Anglophones and Francophones, but unfortunately no evidence is available on this. The only possible comparison is between Ontario and Quebec; one then finds that Ontarians drink more but smoke less and exercise more than Quebeckers (Canada, 1976b). Hence, it is difficult to state whether Quebeckers are equally healthy as Ontarians.

Finally, it could be that Anglophones and Francophones are equally able but that the latter are less interested in the salary that a job can get them and are more interested by other work-related incentive. Two studies provide relevant evidence on this point. The first one by Auclair and Read found in 1964 that "... although both groups consider salary... as being major wants, English-Canadians are more strongly oriented towards this economic incentive"

(Auclair and Read, 1966, p. 541). That study was done using a sample of over 3,000 individuals divided almost equally between Anglophone and Francophone males. It was criticized, however, since no attempts were made in it to standardize for differences in education or age between the two language groups. Doing that for 1975 and using a different sample made up of 500 Francophones working in Quebec and 500 Anglophones working in Ontario, Toulouse, Bellaud and Nightingale found that "... les Canadiens français accordent plus d'importance que les Canadiens anglais au fait d'avoir un salaire élevé..." (Toulouse et al., 1975, p. 7). The authors are aware of the apparent contradiction between their results and those of Auclair and Read but point out that not only is their methodology more correct, but that attitudes may have changed over time (Toulouse et al., 1975, p. 12).

The results of the studies described above make it seem reasonable to assume that in 1970 Anglophones and Francophones had the same interest in remuneration when choosing amongst jobs and that this is not a significant source of differences in earnings.

So, it would appear that the technique used in the preceding parts of the chapter is appropriate and that the results thus obtained are likely to be reasonable upper-bound estimates of the contribution of ethnicity in explaining the determination of earnings in the Quebec labour market. It would therefore be interesting to compare those estimates for Quebec in 1970 to results for other labour markets where language or ethnicity could be expected to contribute to the determination of earnings or for other time periods in the Quebec labour market. Unfortunately, as was shown in Chapter I, there has been little work on the economics of language. Descriptive studies of the socio-economic characteristics of Puerto-Rico (Angle, 1976) and Belgium (Rayside, 1977), two labour markets where bilingualism prevails, indicate that no estimates can be made of the monetary returns to language because of a lack of adequate data. As to studies of Spanish-speaking Americans (Fogel, 1966; Carliner, 1977), they cannot measure adequately the impact of language on earnings since they do not have precise information on the mother tongue of the individuals whose earnings they examine.

It is possible, however, to compare the returns to ethnicity in Quebec to those found in the United States. There, in 1970, the median earnings of black males was sixty per cent of the median earnings of all males (Masters, p. 343) while in Quebec in 1970, the mean earnings of francophone males was ninety-five per cent of those of all males. While this is a somewhat incorrect comparison since the United States economic and numerical minority are one while this is not the case in Quebec, these results indicate that there is much less room for discrimination in Quebec than in the United States where discrimination, it is argued, explains about forty per cent of the earnings differentials between Blacks and Whites (Blinder, 1973, Gwartney, 1970).

As to other studies of the Quebec labour market, the only one where the impact of language on earnings is examined is the one done by Raynauld, Marion, and Béland whose results are reported in the Report of the Royal Commission on Bilingualism and Biculturalism. There one finds that in 1960 Montreal males who were of English-Scottish ethnic origin saw their ethnicity increase their earnings 606 dollars over the observed average of 4,443 dollars that is about thirteen per cent (Canada, 1969, p. 77). This compares to about, according to our calculations, a eight per cent advantage for Anglophones in Montreal in 1970. While these two numbers are not strictly comparable, they are of a simi-

lar nature and, if comparable, would show a decrease in the net differences in earnings between Anglophones and Francophones from 1960 to 1970 which, given the decrease in the gross differences (Vaillancourt, 1978), is not surprising.

The only other study of earnings in the Quebec labour market was recently completed by Ram and Verma (1978): they regressed the earnings of males on education alone, doing so for three specific age groups made up of individuals having worked forty weeks or more in 1970, using the same data as that used in this thesis. They found using different regressions for Francophones and Anglophones that the rate of returns to education was higher for the latter. Their results leave to be desired since they neglect the fact that education could have a non-linear impact on earnings, since they neglect to include age, which was shown in Tables H-5 and H-6 to have some impact or the earnings of males aged twenty-five to thirty-four, and since they do not control for bilingualism.

To summarize, it was shown in this chapter that the gross earnings differences between language groups in Quebec overestimated the net contribution of language to differences in earnings in Quebec but that this net contribution was significant and that it could be, in some cases, broken down into an ethnicity effect and a human capital effect. It was also argued that these returns to ethnicity were not, in most cases, very large and that, in as much as they could be seen as an upper-bound estimate of pure discrimination on the Quebec labour market, they indicated that discrimination was a small contributor to earnings differences in Quebec, quite smaller than say in the United States.

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(1) For some evidence on New Brunswick see "Les différences dans le niveau de revenu des francophones et anglophones au Nouveau-Brunswick, 1971" by François Vaillancourt and Richard Roy, Discussion paper 7824, Economics Department, Université de Montréal.

(2) See Table 3.3

(3) They could also be due to differences in fluency in the English language.

(4) Our discussion with Professor Lambert was held on the Fifteen of November 1976. A discussion on the same topic was held with M. Nowlan, a psychologist working for the Federal Penitentiary Service in Kingston on the First of April 1977. Mr Nowlan had attempted to measure differences in the level of intelligence of Anglophones and Francophones and had found no differences in the mean level and distribution of intelligence.

CONCLUSION

The purpose of this thesis, as stated in the introduction, was to assemble a theoretical framework useful in throwing some light on the role of language in economic activity and to then use that framework to examine the role of language in explaining the earnings of individuals in Quebec. That examination was carried out using ordinary least squares techniques. It yielded estimates of returns to various linguistic skills for males in the Quebec labour market. These returns were then compared to the gross earnings differentials between language groups and were also broken down into a human capital component and an ethnicity component.

Before examining the main empirical findings of the thesis, let us note that the main contributions of the theoretical framework developped in Chapter II to a better understanding of the role of language in economic activity are:

- its focus on the micro-underpinnings of the language choice of economic agents and in particular its use of the Z-commodity framework to examine the choices of consumers;

- the distinction it clearly establishes between to two impacts of an individual's mother tongue on his earnings. There are two impacts since in that case, language is both a form of general human capital and a determinant of ethnicity.

The main empirical findings are that:

- gross differences in earnings between language groups greatly overstate the net impact of language on the earnings of males in Quebec since the net differences are three to six times smaller than the gross differences in earnings between Anglophones and Francophones;

- the net impact of language on earnings, that is the impact once other factors have been controlled for, is significant in that knowing English brings higher earnings to males in Quebec and in its metropolis, Montreal. One can summarize these findings by stating:

- that bilingualism brings no monetary returns to Anglophones in Quebec;

- that bilingualism brings monetary returns to Francophones in Quebec of the order of ten per cent (six per cent in Montreal);

- that being of English mother tongue brings monetary returns to Anglophones in Quebec of the order of four per cent (six per cent in Montreal).

If one looks at more precise subgroups, one finds that:

- the premium to knowing English and to being of English mother tongue goes up as one moves from one cohort to the next in age. This could indicate different patterns of discrimination in the last forty years or different patterns of demand for linguistic human capital;

- the premium to knowing English is highest for those with a Grade 12-13 education increasing as individuals acquire schooling below that level and decreasing for those with some university training. This could result from the fact that university education gives access to public sector jobs where English is not required;

- the premium to knowing English and to being of English mother tongue is highest for occupations like those of managers and drops to almost zero for blue-collar workers;

- the premium to knowing English is lowest in those industries where Francophone ownership is highest.

These differences can be seen, and indeed have been viewed in this thesis, as an indication that linguistic human capital matters in the Quebec labour market with knowing English increasing the earnings of a Francophone in Quebec by the equivalent of 2.1 years of schooling (1.0 in Montreal) (1). As to Anglophones, their ethnic origin is worth about one extra year of schooling in both Quebec and Montreal.

It could be argued, however, that the differences between the earnings of bilingual Francophones and unilingual Francophones are due to the fact that the former are on average, more intelligent than the latter. This is plausible since unilingual Francophones are less educated than bilingual Francophones as a perusal of Tables C-3 and C-9 will establish, and since more intelligent people are usually better educated (Taubman, 1976). However, it seems quite unlikely that all of the net differences between the two groups is due to that, especially since the education variable probably captures a fair share of the impact of intelligence on earnings. Indeed unilingual individuals may be as intelligent as bilingual individuals but they may not have been able to go on for university education because of their lack of linguistic human capital. Hence it is felt, especially in the light of arguments that the earnings equations used to calculate the set differences reported in Table 5.1 underestimate the role of language as a determinant of earnings (Raynauld and Marion, 1972), that the net premium to bilingualism reported there is a reasonable estimate of the market value of being bilingual to a Francophone in Quebec.

As to the differences in earnings between Anglophones and bilingual Francophones, it has already been argued why differences in intelligence of work motivation were unlikely to explain them. It could be argued, however, that differences in the quality of the education of these two groups explain these differences in earnings. Such an argument has been refuted in some quarters (2) and supported by others (Armstrong, 1970). In our view, it is not a sufficiently strong factor to change the main conclusion of our analysis.

The results reported above are interesting, especially in the light of the changes that have taken place since 1971 in the language policy of the Quebec Government. That policy has moved from a laissez-faire approach (Bill 63 in 1969) to a somewhat coercitive approach (Bill 22 in 1974), aimed at insuring the use

of French as the language of work in Quebec. It would, therefore, be interesting to use more recent data to see if these findings still hold or if they have changed, and if so, if the change is due to changes in the language policy.

It would also be interesting to examine the returns to language investment of Allophones in the Quebec labour market to see how individuals who are neither of English or French ethnic origin fare in that market. That, however, will have to await a better database.

Finally, it would be interesting to examine the rate of return to knowing English for individuals, for whom the quality and specific type of education could be controlled for. This could yield interesting answers to some of the queries raised above.

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(1) The returns to Some University (Table 4.9) were divided by 16, the median number of years of schooling in that category, to estimate the returns to an additional year of schooling.

(2) For example, Ryan writes: "As to the comparable quality of education, neither my interviews, nor my researchs... indicates that the English-Canadian primary school at this time (1900-1910) was clearly doing a better job of preparing boys for industry than was the French-Canadian", in William F. Ryan, The Clergy and Economic Growth: Presses de l'Université Laval, 1965.

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APPENDIX A

EARNINGS AND EARNINGS RATIO BY LANGUAGE GROUPS AND OTHER CHARACTERISTICS, MONTREAL, 1970

TABLE A-1

Mean Earnings of Male Fifteen Years and Over Classified According to Mother Tongue, Bilingualism and Occupation, Quebec, 1970.

OCCUPATION	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Administration	7528.	11025.	15386.	15032.	11796.
Applied Sciences	6386.	8753.	11321.	9282.	8900.
Health / Teaching	6386.	8505.	8130.	7784.	7762.
Clerks	4828.	5924.	5962.	5841.	5601.
Sales	4985.	7498.	8471.	8882.	6958.
Primary Workers	4576.	5620.	9018.	7125.	4854.
Processing Workers	5092.	6319.	6338.	6176.	5522.
Assembly Workers	5356.	6441.	7302.	6979.	5924.
Transportation Workers	5357.	6435.	7851.	7044.	6070.
Construction Workers	5437.	6608.	7004.	6876.	5913.
Services	4192.	5591.	6271.	5403.	4986.

Source: Calculations made from the 1/100 sample.

TABLE A-2

Mean Earnings of Males Fifteen Years and Over Classified According to Mother Tongue, Bilingualism and Industry, Quebec, 1970.

INDUSTRY	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Resources	5056.	7018.	8600.	9436.	5745.
Manufacturing	5119.	7006.	9237.	9114.	6460.
Transportation /Communication	6163.	7491.	10792.	8176.	7387.
Finance	6616.	8475.	11273.	9465.	8609.
Construction	5299.	6410.	7405.	8669.	5843.
Trade	4575.	6435.	6014.	8070.	5708.
Services	4878.	6720.	6833.	7247.	6044.
Government	5847.	8260.	8182.	7490.	7499.

Source: Calculations made from the 1/100 sample.

TABLE A-3

Mean Earnings of Males Fifteen Years and Over Classified According to Mother Tongue, Bilingualism and Education, Quebec, 1970.

EDUCATION LEVEL	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Primary 0-8	5354.	6412.	6019.	6604.	5728.
High School 9-10	5049.	6823.	7607.	7561.	6129.
High School 11	4612.	6306.	7573.	8084.	6036.
High School 12-13	4365.	6900.	10776.	9558.	6645.
Some University	6622.	9085.	11470.	9706.	9099.

Source: Calculations made from the 1/100 sample.

TABLE A-4

Mean Earnings of Males Fifteen Years and Over Classified According to Mother Tongue, Bilingualism and Age, Quebec, 1970.

AGE GROUPS	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
15-24	3028.	3485.	2833.	3380.	3212.
25-34	5774.	7396.	8342.	8879.	6791.
35-44	6455.	8783.	11214.	10921.	8113.
45-54	6028.	8624.	11651.	10400.	8040.
55-64	5532.	7656.	10091.	9010.	7263.
65 +	4399.	6559.	5914.	6078.	5589.

Source: Calculations made from the 1/100 sample.

TABLE A-5

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Occupation, Quebec, 1970.

OCCUPATION	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Administration	1.46	2.04	2.00
Applied Sciences	1.37	1.77	1.45
Health / Teaching	1.33	1.27	1.22
Clerks	1.23	1.23	1.21
Sales	1.50	1.70	1.78
Primary Workers	1.23	1.97	1.56
Processing Workers	1.24	1.24	1.21
Assembly Workers	1.20	1.36	1.30
Transportation Workers	1.20	1.47	1.31
Construction Workers	1.22	1.29	1.26
Services	1.33	1.50	1.29

Source: Calculated using TABLE A-1.

TABLE A-6

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Industry, Quebec, 1970.

INDUSTRY	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Resources	1.39	1.70	1.87
Manufacturing	1.37	1.80	1.78
Transportation/ Communication	1.22	1.75	1.33
Finance	1.28	1.70	1.43
Construction	1.21	1.40	1.64
Trade	1.41	1.31	1.76
Services	1.38	1.40	1.49
Government	1.41	1.40	1.28

Source: Calculated using TABLE A-2.

TABLE A-7

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Education, Quebec, 1970.

EDUCATION GROUPS	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Primary 0-8	1.20	1.12	1.23
High School 9-10	1.35	1.51	1.50
High School 11	1.37	1.64	1.75
High School 12-13	1.58	2.47	2.19
Some University	1.37	1.73	1.47

Source: Calculated using TABLE A-3.

TABLE A-8

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Age, Quebec, 1970.

AGE GROUPS	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
15-24	1.16	.94	1.12
25-34	1.28	1.44	1.54
35-44	1.36	1.74	1.69
45-54	1.43	1.93	1.73
55-64	1.38	1.82	1.63
65 +	1.49	1.34	1.38

Source: Calculated using TABLE A-4.

TABLE A-9

Mean Earnings of Males Fifteen Years and Over, Classified According to Mother Tongue and Bilingualism, Montreal, 1970.

LANGUAGE GROUPS	Mean Earnings	Percentage with Respect to Earnings of All Males	Percentage with Respect to Earnings of Unilingual Francophones
Anglophones	8978	1.23	1.66
Unilingual	9152	1.26	1.69
Bilingual	8786	1.21	1.62
Francophones	6721	.92	1.24
Unilingual	5420	.74	-
Bilingual	7327	1.01	1.35
All Males	7280	-	1.34

Source: Calculations made from the 1/100 sample.

TABLE A-10

Mean Earnings of Males Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Occupation, Montreal, 1970.

OCCUPATION	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Administration	8570.	11903.	14655.	14955.	12985.
Applied Sciences	6688.	9146.	11881.	9960.	9797.
Health/ Teaching	5874.	8465.	9764.	7848.	8059.
Clerks	4843.	5855.	5956.	5342.	5629.
Sales	4398.	7276.	8382.	9846.	7568.
Primary* Workers	-	-	-	-	-
Processing Workers	5226.	6800.	9486.	10528.	6386.
Assembly Workers	5712.	6583.	7434.	6886.	6395.
Transportation Workers	5805.	6222.	6741.	5821.	6092.
Construction Workers	5861.	7036.	7689.	8273.	6606.
Services	4203.	5930.	4767.	4975.	5286.

Source: Calculations made from the 1/100 sample.

Note: * Primary Workers are excluded since they number less than ten per cell.

TABLE A-11

Mean Earnings of Males Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Industry, Montreal, 1970.

INDUSTRY	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Manufacturing	5456.	7126.	9207.	9265.	7286.
Transportation/ Communication	6277.	7340.	9586.	8176.	7572.
Finance	4991.	8630.	11348.	11986.	9514.
Construction	5975.	6993.	9268.	10143.	6862.
Trade	4460.	6573.	8233.	8374.	6556.
Services	4904.	7322.	8168.	7506.	6842.
Government	6163.	8373.	8064.	7521.	7903.

Source: Calculations made from the 1/100 sample.

TABLE A-12

Mean Earnings of Males Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Education, Montreal, 1970.

EDUCATION LEVEL	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Primary 0-8	5573.	6336.	7008.	6477.	6054.
High School 9-10	5500.	6908.	8118.	8534.	6839.
High School 11	4451.	6596.	7193.	8587.	6702.
High School 12-13	4199.	6995.	10297.	10383.	7420.
Some University	6674.	9923.	11576.	9651.	9983.

Source: Calculations made from the 1/100 sample.

TABLE A-13

Mean Earnings of Males Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Age, Montreal, 1970.

AGE GROUPS	Francophones		Anglophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
15-24	3261.	3701.	2927.	3564.	3459.
25-34	6164.	7627.	8750.	7851.	7386.
35-44	6567.	9011.	11592.	11176.	9040.
45-54	6175.	8354.	12081.	13033.	9081.
55-64	5741.	7658.	10270.	10118.	8070.
65 +	4415.	5165.	8351.	10513.	6600.

Source: Calculations made from the 1/100 sample.

TABLE A-14

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Occupation, Montreal, 1970.

OCCUPATION	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Administration	1.32	1.71	1.74
Applied Sciences	1.37	1.78	1.49
Health/ Teaching	1.44	1.66	1.34
Clerks	1.21	1.23	1.10
Sales	1.65	1.91	2.24
Primary Workers	-	-	-
Processing Workers	1.30	1.81	2.01
Assembly Workers	1.15	1.30	1.20
Transportation Workers	1.07	1.16	1.00
Construction Workers	1.20	1.31	1.41
Services	1.41	1.13	1.18

Source: Calculated using TABLE A-10.

TABLE A-15

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Industry, Montreal, 1970.

INDUSTRY	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Manufacturing	1.31	1.69	1.70
Transportation/ Communication	1.17	1.53	1.30
Finance	1.73	2.27	2.40
Construction	1.17	1.55	1.70
Trade	1.47	1.85	1.88
Services	1.49	1.67	1.53
Government	1.36	1.31	1.22

Source: Calculated using TABLE A-11.

TABLE A-16

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Education, Montreal, 1970.

EDUCATION GROUPS	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
Primary 0-8	1.14	1.26	1.16
High School 9-10	1.26	1.48	1.55
High School 11	1.48	1.62	1.93
High School 12-13	1.67	2.45	2.47
Some University	1.49	1.73	1.45

Source: Calculated using TABLE A-12.

TABLE A-17

Ratio of the Mean Earnings of Bilingual Francophones, Unilingual Anglophones and Bilingual Anglophones to the Mean Earnings of Unilingual Francophones, Males Fifteen Years and Over, Classified According to Age, Montreal, 1970.

AGE GROUPS	Bilingual Francophones/ Unilingual Francophones	Unilingual Anglophones/ Unilingual Francophones	Bilingual Anglophones/ Unilingual Francophones
15-24	1.13	.90	1.09
25-34	1.24	1.43	1.27
35-44	1.37	1.77	1.70
45-54	1.35	1.96	2.11
55-64	1.33	1.79	1.76
65+	1.17	1.89	2.38

Sources: Calculated using TABLE A-13.

APPENDIX B

THE DEFINITION OF THE FINAL SAMPLE

In Chapter III, a description was given of the various steps that were taken to reduce the Public Use Sample to the Final Sample used in this thesis. In this Appendix, these steps are explained in terms of the variables and codes found in the Public Use Sample Tape of individuals so that it should be possible for a researcher who has access to the Public Use Sample Tapes for individuals to reproduce our results. Each of the criteria for exclusion is now discussed.

- Sex related exclusions: only males are included in the final sample so that individuals are excluded if the variable in field 7 has the value 1.
- Mother tongue related exclusions: only individuals whose mother tongue is English or French are included in the final sample. Hence, individuals are excluded where the variable in field 9 is greater than 2.
- Race related exclusions: only individuals of Caucasian origin are included in the final sample so that individuals are excluded if the variable in field 15 is equal to 4, 10, 12, 13, 20 or 21.
- Earnings related exclusions: only individuals with positive earnings are included in the final sample. Hence individuals are included only if the variable in field 56 is greater than zero.

- Employment related exclusions: only individuals whose main source of earnings in 1970 was wages and salaries were included in the final sample. As a result, individuals who have a value greater than 1 in field 35 and a value not equal to 2 in field 55 are excluded.
- Industry related exclusions: for reasons given in Chapter III, individuals whose variable in field 33 is equal to 0, 1, 3 or 12 are excluded.
- Occupation related exclusions: for reasons given in Chapter III, individuals whose variable in field 34 is equal to 0, 4, 7, 11, 17 or 18 are excluded.

All field numbers correspond to those indicated on the Record layout sheet for the individual sample tapes in the Public Use Sample Tape User Documentation manual made available by Statistics Canada to those who purchased Public Use Sample Tapes.

APPENDIX C

SIZE OF SAMPLE USED, BY LANGUAGE AND OTHER CHARACTERISTICS, QUEBEC AND MONTREAL, 1970

TABLE C-1

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Occupation, Ouebec, 1971, Final Sample.

OCCUPATION	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Administration	98	119	99	408	724
Applied Sciences	78	43	69	214	404
Health/ Teaching	29	46	198	351	624
Clerks	118	138	367	648	1271
Sales	83	128	330	518	1059
Primary Workers	5	6	258	49	318
Processing Workers	31	21	534	239	825
Assembly Workers	96	84	923	585	1688
Transportation Workers	40	51	402	321	814
Construction Workers	35	35	652	343	1065
Services	62	83	485	447	1077

TABLE C-2

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Industry, Quebec, 1971, Final Sample.

INDUSTRY	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Resources	9	14	297	100	420
Manufacturing	252	235	1407	1032	2926
Transportation/ Communication	111	115	431	569	1226
Finance	56	46	82	188	372
Construction	17	34	499	262	812
Trade	77	111	650	621	1459
Services	112	142	658	752	1664
Government	41	57	293	599	990

TABLE C-3

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Education, Quebec, 1971, Final Sample.

EDUCATION LEVEL	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Primary 0-8	140	157	2297	994	3588
High School 9-10	152	136	1021	986	2295
High School 11	103	144	432	597	1276
High School 12-13	96	68	335	662	1161
Some University	184	249	232	884	1549

TABLE C-4

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Age, Quebec, 1971, Final Sample.

AGE GROUPS	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
15-24	131	165	1113	830	2239
25-34	140	163	1241	1165	2709
35-44	133	141	856	912	2042
45-54	142	155	646	721	1664
55-64	114	119	406	438	1077
65+	15	11	55	57	138

TABLE C-5

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Number of Weeks Worked, Quebec, 1971, Final Sample.

WEEKS WORKED	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
1-13	42	43	332	253	670
14-26	30	56	396	260	742
27-39	34	43	540	300	917
40-48	58	88	664	465	1275
49-52	511	524	2385	2845	6265

TABLE C-6

Number of Males Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Region, Quebec, 1971, Final Sample.

REGION GROUPS	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Urban 30 000+	559	610	2099	3083	6351
Urban 30 000-	73	97	1206	688	2064
Rural	43	47	1012	352	1454

TABLE C-7

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Occupation, Montreal, 1971, Final Sample.

OCCUPATION	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Administration	120	91	25	249	485
Applied Sciences	61	48	17	126	252
Health/ Teaching	34	37	54	167	292
Clerks	128	95	131	392	746
Sales	78	109	65	360	612
Primary Workers	0	1	5	2	8
Processing Workers	10	10	96	94	210
Assembly Workers	90	58	275	347	770
Transportation Workers	24	33	115	202	374
Construction Workers	32	21	189	165	407
Services	28	43	137	274	482

TABLE C-8

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Industry, Montreal, 1971, Final Sample.

INDUSTRY	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Manufacturing	217	167	355	608	1347
Transportation/ Communication	110	82	142	378	712
Finance	60	44	21	140	265
Construction	18	23	152	124	317
Trade	82	106	161	411	760
Services	97	95	208	441	841
Government	21	29	70	276	396

TABLE C-9

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Education, Montreal, 1971, Final Sample.

EDUCATION GROUP	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
Primary 0-8	88	89	593	580	1350
High School 9-10	131	100	283	608	1122
High School 11	113	107	98	343	661
High School 12-13	91	49	76	382	598
Some University	182	201	59	465	907

TABLE C-10

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Age, Montreal, 1971, Final Sample.

AGE GROUP	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
15-24	114	128	293	434	969
25-34	133	127	330	674	1264
35-44	129	109	221	535	994
45-54	122	96	148	434	800
55-64	92	75	105	271	543
65+	15	11	12	30	68

TABLE C-11

Number of Males, Fifteen Years and Over, Classified According to Mother Tongue, Bilingualism and Number of Weeks Worked, Montreal, 1971, Final Sample.

WEEKS WORKED GROUPS	Anglophones		Francophones		All Individuals
	Unilingual	Bilingual	Unilingual	Bilingual	
1-13	40	32	67	115	254
14-26	36	46	90	128	300
27-39	27	32	120	184	363
40-48	51	55	176	289	571
49-52	451	381	656	1662	3150

APPENDIX D

LANGUAGE QUESTIONS IN THE 1971 CENSUS OF CANADA

In this Appendix, the text of the questions on language in the 1971 Census of Canada is indicated so that the reader may more easily ascertain the meaning of the language variables used in this thesis.

Question 5: MOTHER TONGUE

Language FIRST spoken and STILL UNDERSTOOD

Check one of

English, French, German, Italian, Other

Question 18: Can you speak English or French well enough to conduct a conversation?

Check one of

English only, French only, both English and French, neither English nor French

In the instruction booklet, the respondent was informed that a conversation meant a conversation of some length on various topics, and that having learnt either English or French at school was not sufficient grounds to define oneself as bilingual.

The text of these questions and of all other questions is found in the General Review, Administrative Report of the 1971 Census, Ottawa, Statistics Canada, 1976 (99-740). The definition of Census terms is found in the Dictionary of the 1971 Census Terms, Ottawa, Statistics Canada, 1972 (12-540).

APPENDIX E

THE DEFINITION OF THE VARIABLES

Chapter IV gives a description of the various variables that will be used in the regressions whose results are reported there. In this Appendix, these variables are defined in terms of the variables and codes found in the Public Use Sample Tape of individuals. As a result, it should be feasible for a researcher, who has access to the Public Use Sample Tape, to recreate those variables. Each basic variable is examined in turn; interactive variables are not examined since they are simply combinations of basic variables.

- The language variable presented in TABLE 4.1 is defined in TABLE E-1.

TABLE E-1

Language variables

Label of the Variable (TABLE 4.1)	Values of the Variables on the Public Use Sample Tape	
	Field 9	Field 18
Unilingual Anglophones	1	1
Bilingual Anglophones	1	3
Unilingual Francophones	2	2
Bilingual Francophones	2	3

- The education variable presented in TABLE 4.2 is defined in TABLE E-2.

TABLE E-2
Education Variables

Label of the Variable (TABLE 4.2)	Values of the Variables on the Public Use Sample Tape
	Field 20
Primary, 0-8	1, 2, 3
High School, 9-10	4
High School, 11	5
High School, 12-13	6, 7
Some University	8-12

- The experience variable is defined as the value found in Field 10, minus the assumed number of years of schooling, defined in TABLE 4.2, minus six.

- The industry variable presented in TABLE 4.3 is defined in TABLE E-3.

TABLE E-3
Industry Variables

Label of the Variable (TABLE 4.3)	Values of the Variables on the Public Use Sample Tape
	Field 33
Resources	2, 4
Manufacturing	5
Transportation/ Communication	7
Finance	9
Construction	6
Trade	8
Services	10
Governement	11

- The occupation variable presented in TABLE 4.4 is defined in TABLE E-4.

TABLE E-4
Occupation Variables

Label of the Variables (TABLE 4.4)	Values of the Variable on the Public Use Sample Tape
	Field 34
Administration	1
Applied Science	2
Health/Teaching	3, 5, 6
Clerks	8
Sales	9
Primary Workers	12
Processing Workers	13
Assembly Workers	14
Transportation Workers	16
Construction Workers	15
Services	10

- The weeks worked variable presented in TABLE 4.5 is defined in TABLE E-5.

TABLE E-5
Weeks Worked Variables

Label of the Variables (TABLE 4.5)	Values of the Variables on the Public Use Sample Tape
	Field 30
Weeks 1-13	2
Weeks 14-26	3
Weeks 27-39	4
Weeks 40-48	5
Weeks 49-52	6

- Finally the region variables presented in TABLE 4.6 is defined in TABLE E-6.

TABLE E-6
Region Variables

Label of the Variables (TABLE 4.6)	Values of the Variables on the Public Use Sample Tape
	Field 54
Urban 30 000^{+}	1
Urban 30 000^{-}	2
Rural	3, 4

APPENDIX F

THE DISTRIBUTION OF ANGLOPHONES AND FRANCOPHONES BY INDUSTRY AND OCCUPATION IN QUEBEC AND MONTREAL, 1970

TABLE F-1

Percentage of Anglophones and Francophones in Four Occupations for Eight Industries, Males, Quebec, 1970

Industry	Occupation / Mother Tongue							
	White Collars		Clerks		Salespeople		Production Workers	
	A	F	A	F	A	F	A	F
Resources	39.1	60.9	-	-	-	-	3.4	96.6
Manufacturing	50.0	50.0	26.1	73.9	26.2	73.8	8.8	91.2
Transportation/ Communication	31.5	68.5	21.1	78.9	36.4	63.6	14.6	85.4
Finance	36.5	63.5	23.1	76.9	25.5	74.5	-	-
Construction	14.9	85.1	11.1	88.9	50.0	50.0	4.9	95.1
Trade	22.8	77.2	20.5	79.5	14.0	86.0	8.2	91.8
Services	15.2	84.8	23.2	76.8	30.9	69.1	12.7	87.3
Governement	6.7	93.3	9.0	91.0	18.2	81.8	11.8	88.2

Source: Calculations made using the 1/100 sample.

Note: A stands for Anglophones, F for Francophones; White Collars are in Administration, Applied Sciences and Health/Teaching occupations. Production Workers are Primary Processing, Assembly or Transportation Workers and Services Employees.

A- indicates that the percentages could not be calculated because of an insufficient number of observations.

TABLE F-2

Percentage of Anglophones and Francophones in Four Occupation for Seven Industries, Males, Montreal, 1970

Industry	Occupation / Mother Tongue							
	White Collars		Clerks		Salespeople		Production Workers	
	A	F	A	F	A	F	A	F
Manufacturing	55.9	44.1	37.9	62.1	40.1	59.9	14.6	85.4
Transportation/ Communication	48.4	51.6	26.9	73.1	-	-	21.6	78.4
Finance	49.4	50.6	43.8	56.2	29.8	70.2	29.2	70.8
Construction	44.4	55.6	-	-	-	-	8.6	91.4
Trade	49.4	50.6	27.0	73.0	25.0	75.0	15.1	84.9
Services	26.6	73.4	26.5	73.5	26.9	73.1	17.0	83.0
Government	12.5	87.5	14.6	85.4	-	-	12.2	87.8

Source: Calculations made using the 1/100 sample.

Note: A stands for Anglophones, F for Francophones; White Collars are in Administration, Applied Sciences and Health/Teaching occupations. Production Workers are Primary Processing, Assembly or Transportation Workers and Services Employees.

A- indicates that the percentages could not be calculated because of an insufficient number of observations.

APPENDIX G

ADDITIONAL REGRESSION RESULTS - I

TABLE G-1

Regression Results, Final Sample, Quebec and Montreal, The Raynauld-Marion Hypothesis, Males, 1970

Variables	Coefficients for Quebec	Montreal
Constant	4.69168** (79.22222)	4.51896 (50.1078)
Language		
Unilingual Anglophones	.35059** (11.68683)	.27946** (7.56986)
Bilingual Anglophones	.33479** (11.71557)	.27091** (7.11641)
Bilingual Francophones	.24478** (15.52617)	.16491** (6.20902)
Age		
Age	.18317** (57.5024)	.19629** (41.102271)
$(Age)^2$	-.00200** (-50.88083)	-.00217** (-36.56614)
Adjusted R^2	.33575	.34110
F Statistic	998.57	481.08
# of Individuals	9869	4638

TABLE G-2

Regression Results, Final Sample
for Montreal and Quebec, Males, 1970

Variables	Coefficients for Quebec Full Year	Montreal Full Year	Quebec No Regions
Constant	7.87570** (296.14218)	7.93634** (240.67865)	6.02184** (235.35912)
Language			
Unilingual Anglophones	.19389** (8.31591)	.16751** (5.58641)	.13124** (5.57085)
Bilingual Anglophones	.17863* (7.72386)	.17760** (5.67308)	.13912** (6.15191)
Bilingual Francophones	.10322** (7.51167)	.12287** (5.49589)	.10274** (7.97392)
Education			
High School 9-10	.13822** (8.44502)	.18989** (7.92042)	.12632** (7.94168)
High School 11	.23695** (11.47482)	.27289** (9.35525)	.22146** (10.93663)
High School 12-13	.29513** (14.05475)	.34691** (11.68524)	.27766** (13.42326)
Some University	.58314** (28.70385)	.671541** (23.65061)	.59498** (29.40754)
Experience			
Experience	.05108** (32.81078)	.05341** (24.08917)	.06532** (45.64247)
(Experience)^2	-.00082** (-28.74124)	-.00085** (-20.49219)	-.00103** (-38.74356)

TABLE G-2
(continued)

Variables	Coefficients for Quebec Full Year	Montreal Full Year	Quebec No Regions
Regions			
Urban 30 000+	.13481** (7.04458)	-	-
Urban 30 000-	.13190** (6.14787)	-	-
Weeks Worked			
14 to 26 weeks	-	-	.83925** (28.32275)
27 to 39 weeks	-	-	1.34479** (46.81633)
40 to 48 weeks	-	-	1.66017** (60.38910)
49 to 52 weeks	-	-	1.81202** (74.83083)
Adjusted R^2	.26882	.28790	.61668
F Statistic	210.36	142.46	1222.19
# of Individuals	6265	3150	9869

TABLE G-3

Regression Results, Final Sample
Quebec and Montreal, Males, 1970

Variables	Coefficients for Quebec: Industry Variables	Quebec: Occupation Variables	Montreal: Industry Variables	Montreal: Occupation Variables
Constant	6.11872** (166.97631)	6.10619** (154.77310)	5.94038** (136.73447)	5.99193** (37.03749)
Language				
Unilingual Anglophones	.12146** (5.14993)	.12313** (5.21827)	.11291** (3.74299)	.09634** (3.22921)
Bilingual Anglophones	.13389** (5.93110)	.14793** (6.52833)	.11986** (3.87719)	.12218** (3.98266)
Bilingual Francophones	.09854** (7.55682)	.10631** (8.15515)	.06456** (2.99706)	.07761** (3.64403)
Education				
High School 9-10	.12768** (8.11317)	.11975** (7.57816)	.14949** (6.23640)	.13836** (5.81669)
High School 11	.21925** (10.90065)	.19984** (9.78266)	.23821** (8.07262)	.20480** (6.89481)
High School 12-13	.28170** (13.62067)	.23866** (11.23916)	.29715** (9.91222)	.24407** (7.98286)
Some University	.61763** (29.90397)	.47566** (20.75322)	.67262** (22.77776)	.53143** (16.66979)
Experience				
Experience	.06263** (44.05057)	.06142** (42.95183)	.06664** (31.77188)	.06483** (31.10375)
(Experience)^2	-.00099** (-37.38175)	-.00097** (-36.39436)	-.00106** (-26.55613)	-.00102** (-25.89332)

TABLE G-3
(continued)

Variables	Coefficients for Quebec: Industry Variables	Quebec: Occupation Variables	Montreal: Industry Variables	Montreal: Occupation Variables
Weeks Worked				
13-26 weeks	.85101** (29.08716)	.82428** (28.25659)	.92334** (19.41408)	.91400** (19.56276)
27-39 weeks	1.34257** (47.33568)	1.31882** (46.55502)	1.33298** (28.79623)	1.30602** (28.69435)
40-48 weeks	1.66819** (61.39956)	1.64083** (60.52305)	1.75059** (40.02421)	1.71709** (39.90165)
49-52 weeks	1.82817** (75.98433)	1.79596** (74.84020)	1.92335** (49.46090)	1.87788** (49.00071)
Regions				
Urban 30 000+	.07856** (4.66718)	.06961** (4.15385)	-	-
Urban 30 000-	.08544** (4.56610)	.08128** (4.35222)	-	-
Occupation				
Administration	-	.16623** (4.22456)		.30035* (1.87302)
Applied Sciences	-	.12078** (2.81079)	-	.22400 (1.38288)
Health/Teaching	-	.02378 (.59388)	-	.08206 (.50815)
Clerks	-	-.16743** (-4.67867)	-	-.10965 (-.68956)
Sales	-	-.12443** (-3.44073)	-	-.04730 (-.29675)

TABLE G-3
(continued)

Variables	Coefficients for Quebec		Coefficients for Montreal	
	Industry Variables	Occupation Variables	Industry Variables	Occupation Variables
Assembly Workers	-	-.06755* (-1.99145)	-	.04191 (.26405)
Processing Workers	-	-.08212* (-2.26309)	-	.01593 (.09839)
Transportation Workers	-	-.11316** (-3.10293)	-	-.04546 (-.28405)
Construction Workers	-	.03340 (.95513)	-	.17335 (1.08505)
Services	-	-.22741** (-6.38630)	-	-.17114 (-1.07355)
Industry				
Manufacturing	-.12234** (-4.18420)	-	-	-
Transportation/ Communication	-.09526** (-2.99181)	-	.03802 (1.47956)	-
Finance	-.09303* (-2.31899)	-	.06908* (1.83645)	-
Construction	-.01134 (-.34280)	-	.20919** (5.86615)	-
Trade	-.28654** (-9.21364)	-	-.11909** (-4.71694)	-
Services	-.27188** (-8.77352)	-	-.12702** (-5.07511)	-
Government	-.10261** (-3.11331)	-	.06950* (2.16825)	-

TABLE G-3
(continued)

Coefficients for

Variables	Quebec		Montreal	
	Industry Variables	Occupation Variables	Industry Variables	Occupation Variables
Adjusted R^2	.62748	.63007	.61882	.63054
F Statistic	756.53	673.29	397.21	346.04
# of Individuals	9869	9869	4638	4638

TABLE G-4

Regression Results, Final Sample
Quebec and Montreal, Selected Age
Groups and Weeks Worked Groups

Variables	Coefficients for Quebec Aged 25-64		Montreal Aged 25-64	
	Full Year	All	Full Year	All
Constant	8.12445** (246.87257)	6.73139** (145.81632)	8.23268** (192.97975)	6.88288** (99.01037)
Language				
Unilingual Anglophones	.22601** (9.74149)	.22253** (9.63032)	.21463** (7.05970)	.19958** (6.66763)
Bilingual Anglophones	.20265** (8.72298)	.19296** (8.68125)	.19386** (6.07000)	.15011** (4.82395)
Bilingual Francophones	.09644** (6.93739)	.09541** (7.39707)	.12057** (5.25049)	.07909** (3.68297)
Education				
High School 9-10	.13025** (8.00594)	.10687** (7.11822)	.17626** (7.37602)	.13739** (6.04155)
High School 11	.22425** (10.42534)	.20441** (9.78882)	.24566** (8.12327)	.19842** (6.63888)
High School 12-13	.28187** (13.27750)	.27089** (12.97084)	.30884** (10.31434)	.29188** (9.85521)
Some University	.51519** (25.10400)	.50631** (25.69607)	.59453** (20.60422)	.57104** (20.26275)
Experience				
Experience	.03420** (16.25484)	.03706** (18.99597)	.03386** (11.29777)	.03782** (13.26732)
(Experience)^2	-.00058** (-15.51502)	-.00062** (-17.99234)	-.00056** (-10.28669)	-.00062** (-12.08246)

TABLE G-4
(continued)

Variables	Coefficients for Quebec Aged 25-64		Coefficients for Montreal Aged 25-64	
	Full Year	All	Full Year	All
Regions				
Urban 30 000+	.15566 (7.97789)	.12950** (7.78402)	-	-
Urban 30 000-	.13666 (6.27236)	.13392** (7.14692)	-	-
Weeks Worked				
14-26 weeks	-	.52208** (11.9159)	-	.41588** (5.75460)
27-39 weeks	-	.97176** (23.36658)	-	.83013 (12.35826)
40-48 weeks	-	1.25275** (31.48318)	-	1.20776** (19.13991)
49-52 weeks	-	1.38116** (36.80392)	-	1.34889** (22.57305)
Adjusted R^2	.22430	.40726	.22559	.37535
F Statistics	142.51	344.13	89.33	167.77
# of Individuals	5384	7492	2724	3601

TABLE G-5

Significance Test of Differences Between
Language Coefficients, Regressions in TABLES G-1 to G-4
(t-statistics in brackets)

Raynauld/Marion Equation (G-1)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	.01580 (-.41350)	.00855 (.19987)
Unilingual Anglophones - Bilingual Francophones	.10581* (3.50757)	.11455* (3.43822)
Bilingual Anglophones - Bilingual Francophones	.09001* (3.12429)	.10600* (3.18159)

Full Year Results (G-2)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-.01526 (-.54293)	.01009 (-.31562)
Unilingual Anglophones - Bilingual Francophones	.09067* (4.18230**)	.04464 (1.58564)
Bilingual Anglophones - Bilingual Francophones	.07541* (3.51601)	.05473* (1.84900)

Occupation Results (G-3)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	.02480 (.86082)	.02584 (.79744)
Unilingual Anglophones - Bilingual Francophones	.01682 (.74480)	.01873 (.74037)
Bilingual Anglophones - Bilingual Francophones	.04162* (1.94054)	.04451* (1.69675)

TABLE G-5
(continued)

Industry Results (G-3)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	.01243 (.43145)	.00695 (.21247)
Unilingual Anglophones - Bilingual Francophones	.02292 (1.01491)	.04835* (1.89644)
Bilingual Anglophones - Bilingual Francophones	.03535 (1.06865)	.05530* (2.06091)

Age 25-65 and Full Year (G-4)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-.02336 (-0.83642)	-.02077 (.65033)
Unilingual Anglophones - Bilingual Francophones	.12957* (6.39901)	.09406* (3.80838)
Bilingual Anglophones - Bilingual Francophones	.10621* (4.89910)	.07329* (2.75052)

Age 25-64 and All (G-4)

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-.02957 (-1.05878)	-.04947 (-1.51234)
Unilingual Anglophones - Bilingual Francophones	.12712* (5.80221)	.12049* (4.83899)
Bilingual Anglophones - Bilingual Francophones	.09755* (4.65051)	.07102* (2.66533)

APPENDIX H

ADDITIONAL REGRESSION RESULTS - II

TABLE H-1
Regression Results, Final Sample
Broken Down by Four Language Groups
Quebec, Males, 1970

Variables	Coefficients for			
	Anglophones		Francophones	
	Unilingual	Bilingual	Unilingual	Bilingual
Constant	5.38875** (44.68122)	6.01132** (43.67976)	6.05874** (150.44838)	6.13007** (125.43089)
Education				
High School 9-10	.23753** (3.54020)	.11926 (1.62710)	.11178** (4.88660)	.12145** (4.75626)
High School 11	.36446** (4.79191)	.26324** (3.46041)	.19707** (6.01851)	.18577** (6.08776)
High School 12-13	.44029** (5.80655)	.28551** (3.20182)	.22673** (6.26068)	.24055** (8.6998)
Some University	.80109** (11.47533)	.56026** (7.92952)	.60585** (14.71906)	.54241** (18.93246)
Experience				
Experience	.07854** (14.11912)	.07053** (14.63711)	.06507** (28.02205)	.05890** (27.12214)
$(\text{Experience})^2$	-.00126** (-12.10415)	-.00110** (-11.99771)	-.00102** (-24.58186)	-.00095** (-22.78046)
Weeks Worked				
14-26 weeks	1.03616** (7.87093)	.61754** (5.13860)	.84869** (20.44179)	.81368** (16.92170)
27-39 weeks	1.83598** (14.02369)	1.18481** (9.13260)	1.29406** (32.57752)	1.35146** (28.88454)
40-48 weeks	2.08723** (17.31099)	1.67735** (14.62940)	1.56990** (40.40046)	1.69739** (38.73894)
49-52 weeks	2.24951** (21.82871)	1.82083** (18.16520)	1.72007** (49.29441)	1.83884** (48.33789)

TABLE H-1
(continued)

Variables	Coefficients for			
	Anglophones		Francophones	
	Unilingual	Bilingual	Unilingual	Bilingual
Regions				
Urban: 30 000+	.10990 (1.20990)	.12597 (1.39685)	.03835* (1.80345)	.07981** (2.60690)
Urban: 30 000-	.15546 (1.45315)	.03482 (.33214)	.07723** (3.29127)	.09551** (2.69004)
Adjusted R^2	.72594	.62157	.58998	.59043
F Statistic	149.78	104.07	518.52	496.19
# of Individuals	675	754	4317	4123

TABLE H-2
Regression Results, Final Sample
Broken Down by Four Language Groups,
Montreal, Males, 1970

Variables	Coefficients for			
	Anglophones		Francophones	
	Unilingual	Bilingual	Unilingual	Bilingual
Constant	5.86967** (44.92854)	5.71664** (40.54667)	6.08813** (74.36329)	6.05115** (108.83436)
Education				
High School 9-10	.03203** (.34313)	.34428** (3.48668)	.13298** (3.00010)	.12774** (4.15476)
High School 11	.25341** (2.58309)	.37852** (3.86430)	.15516* (2.27719)	.19056** (5.06912)
High School 12-13	.40577** (4.01085)	.57170 (4.77232)	.10096 (1.35245)	.22985** (6.41389)
Some University	.76776** (8.11914)	.80607 (8.32185)	.53550** (6.54077)	.60006** (16.93995)
Experience				
Experience	.08499** (12.00086)	.06225** (9.10397)	.06928** (15.46180)	.06384** (23.54225)
$(\text{Experience})^2$	-.00129** (-9.59427)	-.00086** (-6.54330)	-.00111** (-13.87272)	-.00107** (-20.26904)
Weeks Worked				
14-26 weeks	.89578** (5.82948)	.92428** (6.03663)	.98123** (10.76111)	.89556** (13.86609)
27-39 weeks	1.29109** (7.76136)	1.49369** (9.01256)	1.27152** (14.59302)	1.33288** (21.95758)
40-48 weeks	1.74412** (11.61876)	2.01425** (13.04518)	1.65056** (19.76001)	1.74883** (30.53986)
49-52 weeks	1.81024** (14.41157)	2.07832** (15.40569)	1.72364** (22.75472)	1.98155** (38.88117)

TABLE H-2
(continued)

Variables	Coefficients for			
	Anglophones		Francophones	
	Unilingual	Bilingual	Unilingual	Bilingual
Adjusted R^2	.61368	.60373	.54988	.62796
F Statistic	96.95	84.03	136.35	402.21
# of Individuals	605	546	1109	2378

TABLE H-3
Results of Chow Tests, All Coefficients
(F-Statistics)

Equations Compared	Quebec	Montreal
Unilingual Anglophones/ Bilingual Anglophones	2.083*	.9599
Unilingual Anglophones/ Unilingual Francophones	7.1468**	3.5337**
Unilingual Anglophones/ Bilingual Francophones	5.4214**	4.2887**
Bilingual Anglophones/ Unilingual Francophones	5.5131**	7.6817**
Bilingual Anglophones/ Bilingual Francophones	2.4059**	3.5325**
Unilingual Francophones/ Bilingual Francophones	7.399**	4.9804**

Note: A * indicates that the F-statistic is significant at the ninety-five per cent level.

A ** indicates that the F-statistic is significant at the ninety-nine per cent level.

TABLE H-4
Regression Results, Final Sample
Quebec and Montreal, Equations with
Language-Education and Language-Experience
Variables

Variables	Coefficients for Quebec		Montreal	
	Language/ Education	Language/ Experience	Language/ Education	Language/ Experience
Constant	5.99680** (207.49663)	5.99967** (188.70497)	5.94562** (134.39994)	5.94137** (109.46025)
Language				
Unilingual Anglophones	.01916 (.39970)	-.11471* (-2.14345)	.12216* (1.90228)	-.04140 (-.62163)
Bilingual Anglophones	.15611** (3.42243)	.01570 (.33318)	.03618 (.56654)	.04194 (.65436)
Bilingual Francophones	.08383** (3.95492)	.14000** (4.88320)	.02578 (.78662)	.10244* (2.07129)
Education				
High School 9-10	.10565** (4.89031)	.12096** (7.48897)	.14381** (3.48816)	.13336** (5.43958)
High School 11	.19501** (6.41896)	.21034** (10.28220)	.18235** (2.91778)	.21162** (7.04797)
High School 12-13	.23217** (6.86135)	.25698** (12.23150)	.14498* (2.08619)	.27036** (8.86126)
Some University	.60209** (15.36163)	.58155** (28.54926)	.54238** (6.99175)	.64069** (21.94484)
Experience				
Experience	.06475** (44.80871)	.06306** (29.95522)	.06862** (32.25260)	.06829** (17.05371)
$(\text{Experience})^2$	-.00103** (-38.10447)	-.00099** (-25.03581)	-.00109** (-27.09772)	-.00109** (-14.43045)

TABLE H-4
(continued)

Variables	Coefficients for Quebec		Coefficients for Montreal	
	Language/ Education	Language/ Experience	Language/ Education	Language/ Experience
Weeks Worked				
14-26 weeks	.83879** (28.25391)	.84111** (28.41345)	.94069** (19.57338)	.93386** (19.43413)
27-39 weeks	1.34593** (46.75188)	1.34378** (46.82681)	1.34031** (28.66539)	1.34171** (28.70799)
40-48 weeks	1.65565** (60.11927)	1.65398** (60.20938)	1.75310** (39.67779)	1.75194** (39.64308)
49-52 weeks	1.80672** (74.35070)	1.80413** (74.46479)	1.91401** (48.86918)	1.90979** (48.72284)
Regions				
Urban 30 000+	.05147** (3.06820)	.05554** (3.32026)	-	-
Urban 30 000-	.07408** (3.90697)	.07584** (4.00979)	-	-
Unilingual Anglophones				
High School 9-10	.10261 (1.51968)	-	-.14443* (-1.65658)	-
High School 11	.09480 (1.23218)	-	-.01101 (-.10967)	-
High School 12-13	.22472** (2.81202)	-	.21763* (2.00582)	-
Some University	.15121* (2.08947)	-	.10733 (1.01633)	-

TABLE H-4
(continued)

Variables	Coefficients for Quebec		Coefficients for Montreal	
	Language/ Education	Language/ Experience	Language/ Education	Language/ Experience
Bilingual Anglophones				
High School 9-10	-.00647 (-.09578)	-	.11690 (1.28252)	-
High School 11	.03618 (.51959)	-	.10207 (1.00858)	-
High School 12-13	.04410 (.51170)	-	.34042** (2.81062)	-
Some University	-.09616 (-1.42327)	-	.12328 (1.17710)	-
Bilingual Francophones				
High School 9-10	.03646 (1.13060)	-	.02203 (.42515)	-
High School 11	.03118 (.76961)	-	.07332 (1.01821)	-
High School 12-13	.04580 (1.07694)	-	.14105* (1.81588)	-
Some University	-.01118 (-.24536)	-	.12703 (1.51238)	-
Unilingual Anglophones				
Experience	-	.02680** (5.24200)	-	.01167* (1.82595)
$(\text{Experience})^2$	-	-.00048** (-4.78262)	-	-.00014 (-1.09457)

TABLE H-4
(continued)

Variables	Coefficients for			
	Quebec		Montreal	
	Language/ Education	Language/ Experience	Language/ Education	Language/ Experience
Bilingual Anglophones				
Experience	-	.01146** (2.57212)	-	.00112 (.18057)
(Experience)^2	-	-.00018* (-1.99452)	-	.00008 (.64597)
Bilingual Francophones				
Experience	-	-.00200 (-.72212)	-	-.00128 (-.26854)
(Experience)^2	-	.00000 (.07380)	-	-.00002 (-.24956)
Adjusted R^2	.61740	.61887	.60958	.61062
F Statistic	590.76	764.03	291.42	383.72
# of Individuals	9869	9869	4638	4638

TABLE H-5
Regression Results, Final Sample
Broken Down for Four Age Groups
Quebec, Males, 1970

Variables	Coefficients for Age 25-34	Age 35-44	Age 45-54	Age 55-64
Constant	6.47322** (69.38891)	7.75224** (31.24481)	7.89645** (13.95414)	7.02074** (5.88765)
Language				
Unilingual Anglophones	.17142** (4.07293)	.25645** (5.95681)	.28210** (6.17196)	.14773** (2.42888)
Bilingual Anglophones	.21092** (5.32298)	.22870** (5.44026)	.20121** (4.59577)	.10380* (1.75897)
Bilingual Francophones	.11442** (5.54488)	.11447** (4.96170)	.08584** (3.06596)	.02038 (.50418)
Education				
High School 9-10	.11470** (4.09879)	.10991 (3.84792)	.07389* (2.17909)	.09540* (1.85707)
High School 11	.23203** (6.38991)	.15839** (3.70606)	.14755** (3.08639)	.22403** (3.11821)
High School 12-13	.29492** (7.60584)	.22797** (5.58118)	.20019** (4.12500)	.31722** (4.65093)
Some University	.50963** (12.07063)	.46828** (9.91077)	.43845** (7.16114)	.44324** (5.31983)
Experience				
Experience	.04779** (4.66783)	-.02688 (-1.38262)	-.02338 (-.73193)	.02743 (.52786)
$(\text{Experience})^2$	-.00101** (-2.61760)	.00057 (1.41334)	.00019 (.41950)	-.00048 (-.84585)

TABLE H-5
(continued)

Variables	Coefficients for			
	Age 25-34	Age 35-44	Age 45-54	Age 55-64
Weeks Worked				
14 to 26 weeks	.72724** (10.37194)	.33358** (3.65328)	.43939** (5.11017)	.40315** (3.13844)
27 to 39 weeks	1.19367** (17.86145)	.84013** (9.53606)	.82094** (10.30328)	.82577** (6.87111)
40-48 weeks	1.48423** (22.97322)	1.03694** (12.22409)	1.17088** (15.71678)	1.08716** (9.40493)
49-52 weeks	1.63779** (26.98531)	1.16577** (14.32190)	1.29423** (18.56367)	1.16601** (10.76641)
Regions				
Urban 30,000 +	.04473* (1.67956)	.14980** (5.02511)	.18054** (5.05723)	.25723** (4.85843)
Urban 30,000 -	.05191* (1.72962)	.17523** (5.17708)	.18391** (4.67374)	.20881** (3.47029)
Adjusted R^2	.40646	.39434	.44780	.34724
F. Statistic	124.63	89.59	90.91	39.16
# of individuals	2709	2042	1664	1077

TABLE H-6
Regression Results, Final Sample
Broken Down for Four Age Groups
Montreal, Males, 1970

Variables	Coefficients for Age 25-34	Age 35-44	Age 45-54	Age 55-64
Constant	6.41547** (47.06556)	7.68457** (22.71440)	7.91008** (8.95835)	10.83058** (6.77742)
Language				
Unilingual Anglophones	.13149** (2.58975)	.20794** (3.92837)	.28142** (4.02384)	.31935** (4.14736)
Bilingual Anglophones	-.02313 (-.45198)	.20773** (3.77553)	.29465** (3.96905)	.27679** (3.41682)
Bilingual Francophones	.07515* (2.23072)	.09722** (2.58751)	.10476* (1.98147)	.09277 (1.50938)
Education				
High School 9-10	.17933** (4.09029)	.13439** (3.14755)	.10626* (1.92595)	.02213 (.33411)
High School 11	.23442** (4.12164)	.23053** (3.99324)	.11301 (1.56953)	.11858 (1.37103)
High School 12-13	.32677** (5.69859)	.31168** (5.43905)	.20310** (2.63478)	.12434 (1.49663)
Some University	.60147** (9.47287)	.53173** (8.43317)	.49789** (5.63293)	.52631** (4.90829)
Experience				
Experience	.06101** (4.15021)	-.00393 (-.14885)	-.01306 (-.25231)	-.12348* (-1.74566)
$(\text{Experience})^2$	-.00140** (-2.38817)	.00005 (.08742)	.00004 (.05084)	.00121 (1.54714)

TABLE H-6
(continued)

Variables	Coefficients for			
	Age 25-34	Age 35-44	Age 45-54	Age 55-64
Weeks Worked				
14-26 weeks	.64964** (5.87986)	.10671 (.67775)	.42082** (2.49615)	.16139 (.94057)
27-39 weeks	1.10589** (10.79360)	.68464** (4.77279)	.74496** (4.79412)	.47558** (2.69251)
40-48 weeks	1.51131** (15.60033)	1.10159** (7.91343)	1.05996** (7.29902)	.74909** (4.93981)
49-52 weeks	1.67363** (18.43795)	1.13626** (8.47839)	1.23538** (8.91892)	.91808** (6.42130)
Adjusted R^2	.40168	.38303	.33864	.35210
F Statistic	66.22	48.42	32.47	23.66
# of Individuals	1464	994	800 800	543

TABLE H-7

Significance Test of Differences Between
Language Coefficients, Age Subgroups
(t-statistics in brackets)

	Age Group 25-34	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.03950 (0.74916)	-0.15462* (-2.67542)
Unilingual Anglophones- Bilingual Francophones	0.05700 (1.39066)	0.05634 (1.26296)
Bilingual Anglophones- Bilingual Francophones	0.09650* (2.50840)	-0.09828* (-3.01810)

	Age Group 35-44	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.02775 (-0.52443)	-0.00021 (-0.00366)
Unilingual Anglophones- Bilingual Francophones	0.14198* (3.48476)	0.11072* (2.52027)
Bilingual Anglophones- Bilingual Francophones	0.11423* (2.85575)	0.11051* (2.35608)

	Age Group 45-54	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.08089 (-1.46951)	0.01323 (0.26783)
Unilingual Anglophones- Bilingual Francophones	0.19626* (4.66493)	0.17666* (3.20407)
Bilingual Anglophones- Bilingual Francophones	0.11537* (2.83165)	0.18989* (3.42158)

TABLE H-7
(continued)

	Age Group 55-64	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.04393 (-0.62886)	-0.04256 (-0.53663)
Unilingual Anglophones- Bilingual Francophones	0.12735* (2.26188)	0.22658* (3.69021)
Bilingual Anglophones- Bilingual Francophones	0.08342 (1.51548)	0.18402* (2.73713)

Sources: TABLES H-5 and H-6.

TABLE H-8
Regression Results, Final Sample
Broken Down in Five Education Groups,
Quebec, Males, 1970

Variables	Coefficients for		
	Primary 0-8	High School 9-10	High School 11
Constant	6.54132** (118.37256)	6.09400** (112.91547)	5.96701** (90.48492)
Language			
Unilingual Anglophones	.00869 (.20060)	.14955** (3.18072)	.15296** (2.34610)
Bilingual Anglophones	.13959** (3.36902)	.16704** (3.41227)	.19982** (3.50899)
Bilingual Francophones	.08123** (4.15432)	.12588** (5.06775)	.09966** (2.60951)
Experience			
Experience	.05041** (18.55623)	.07612** (23.23551)	.08248** (16.37265)
$(\text{Experience})^2$	-.00076** (-17.78801)	-.00130** (-19.24924)	-.00150** (-13.13818)
Weeks Worked			
14-26 weeks	.46325** (8.84914)	.86117** (13.47980)	.97563** (12.77308)
27-39 weeks	.94127** (19.20770)	1.31533** (21.52108)	1.58609** (19.58822)
40-48 weeks	1.19857** (24.96816)	1.62614** (28.43446)	1.94904** (27.20334)
49-52 weeks	1.30482** (29.20135)	1.79217** (34.24337)	2.06533** (33.36010)

TABLE H-8
(continued)

Variables	Coefficients for		
	Primary 0-8	High School 9-10	High School 11
Regions			
Urban 30 000+	.13405** (6.08570)	-.01732 (-.52905)	-.04353 (-.84186)
Urban 30 000-	.13299** (5.36119)	.00865 (.23125)	-.00295 (-.05069)
Adjusted R^2	.40180	.61317	.71137
F Statistic	220.03	331.57	286.67
# of Individuals	3588	2295	1276

TABLE H-8
(continued)

Variables	Coefficients for High School 12-13	Coefficients for Some University
Constant	6.19357** (86.64164)	6.43585** (76.39388)
Language		
Unilingual Anglophones	.20082** (2.76083)	.18399** (3.03472)
Bilingual Anglophones	.16086* (1.97467)	.07935 (1.43133)
Bilingual Francophones	.10897** (2.61438)	.07152 (1.59909)
Experience		
Experience	.07808** (14.73247)	.06715** (16.55378)
$(\text{Experience})^2$	-.00132** (-11.38342)	-.00127** (-12.92035)
Weeks Worked		
14-26 weeks	.92882** (11.53953)	.82828** (11.05136)
27-39 weeks	1.16545** (13.22345)	1.45906** (19.09689)
40-48 weeks	1.59824** (19.89708)	1.88913** (24.55087)
49-52 weeks	1.82930** (28.53629)	2.02634** (32.57861)

TABLE H-8
(continued)

Variables	Coefficients for	
	High School 12-13	Some University
Regions		
Urban 30 000+	.01135 (.18087)	.07687 (1.16499)
Urban 30 000-	.05373 (.76135)	.11704 (1.57550)
Adjusted R^2	.72108	.66642
F Statistic	273.63	282.15
# of Individuals	1161	1549

TABLE H-9
Regression Results, Final Sample
Broken Down in Five Education Groups,
Montreal, Males, 1970

Variables	Coefficients for		
	Primary 0-8	High School 9-10	High School 11
Constant	6.66985** (67.02543)	6.05688** (78.97071)	5.85254** (60.77783)
Language			
Unilingual Anglophones	.11665* (1.93613)	-.01739 (-.31070)	.12109 (1.39061)
Bilingual Anglophones	.03549 (.59330)	.14419** (2.37099)	.14006 (1.57381)
Bilingual Francophones	.03766 (1.20495)	.03222 (.84502)	.07274 (1.01940)
Experience			
Experience	.05313** (11.10792)	.08472** (18.59579)	.07817** (11.05493)
$(\text{Experience})^2$	.00079** (-10.55828)	-.00144** (-15.76913)	-.00138** (-8.94315)
Weeks Worked			
14-26 weeks	.52791** (5.34903)	.79773** (8.09353)	1.20298** (9.75837)
27-39 weeks	.84176** (9.12208)	1.28554** (14.35577)	1.56669** (12.31503)
40-48 weeks	1.19139** (13.58148)	1.63851** (19.10645)	1.99860** (17.17796)
49-52 weeks	1.26028** (15.39008)	1.82530** (23.47821)	2.21072** (22.69079)

TABLE H-9
(continued)

Variables	Coefficients for		
	Primary 0-8	High School 9-10	High School 11
Adjusted R^2	.31169	.62435	.67502
F Statistic	68.88	208.01	153.32
# of Individuals	1350	1122	661

TABLE H-9
(continued)

Variables	Coefficients for High School 12-13	Coefficients for Some University
Constant	5.92165** (60.99015)	6.38799** (60.85482)
Language		
Unilingual Anglophones	.35224** (4.04558)	.24592** (2.70659)
Bilingual Anglophones	.36961** (3.66833)	.19874* (2.20785)
Bilingual Francophones	.16028** (2.33327)	.16874* (2.01659)
Experience		
Experience	.07556** (12.13435)	.06671** (11.51739)
$(\text{Experience})^2$	-.00134** (-10.29987)	-.00119** (-8.08727)
Weeks Worked		
14-26 weeks	1.15497** (9.95390)	.82176** (7.72720)
27-39 weeks	1.41003** (11.94857)	1.32849** (11.67288)
40-48 weeks	1.88866** (16.33579)	1.92171** (18.14668)
49-52 weeks	2.11247** (20.99287)	2.09332** (23.33971)
Adjusted R^2	.72594	.66053
F Statistic	176.70	196.88
# of Individuals	598	907

TABLE H-10
Significance Test of Differences Between
Language Coefficients, Education Subgroups
(t-statistics in brackets)

	Primary Education	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.13090* (2.27180)	-0.08166 (-1.03491)
Unilingual Anglophones- Bilingual Francophones	-0.07254 (-1.62204)	0.07899 (1.31468)
Bilingual Anglophones- Bilingual Francophones	0.05836 (1.37556)	-0.00217 (-0.03637)

	High School 9-10	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.01749 (0.28042)	0.16158* (2.37464)
Unilingual Anglophones- Bilingual Francophones	0.02367 (0.51048)	-0.04961 (-0.99619)
Bilingual Anglophones- Bilingual Francophones	0.04116 (0.85088)	0.11197* (2.02084)

	High School 11	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.04686 (0.96871)	0.01897 (0.22937)
Unilingual Anglophones- Bilingual Francophones	0.05330 (0.86578)	0.04835 (0.71522)
Bilingual Anglophones- Bilingual Francophones	0.10016* (1.88612)	0.06732 (0.97269)

TABLE H-10
(continued)

	High School 12-13	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.03996 (-0.42719)	0.01737 (0.18485)
Unilingual Anglophones- Bilingual Francophones	0.09185 (1.39584)	0.19196* (3.03515)
Bilingual Anglophones- Bilingual Francophones	0.05189 (0.68490)	0.20933* (2.57472)

	Some University	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.10464* (-1.81332)	-0.04718 (-0.75939)
Unilingual Anglophones- Bilingual Francophones	0.11247* (2.31516)	0.07718 (1.46380)
Bilingual Anglophones- Bilingual Francophones	0.00783 (0.18303)	0.03000 (0.58387)

Sources: TABLES H-8 and H-9.

TABLE H-11
Regression Results, Final Sample
Broken Down for Eight Industries,
Quebec, Males, 1970

Variables	Resources	Manufacturing	Transportation/ Communication	Finance
Constant	6.28511** (56.03284)	6.04304** (129.10539)	5.98779** (74.31442)	6.17579** (35.86279)
Language				
Unilingual Anglophones	.17025 (.94718)	.15457** (4.38117)	.19416** (3.59853)	.19226* (1.88675)
Bilingual Anglophones	.20918 (1.36607)	.19133** (5.31562)	.05937 (1.12363)	.00793 (.07249)
Bilingual Francophones	.02226 (.32717)	.11911** (5.62816)	.05994* (1.78954)	.09381 (1.23511)
Education				
High School 9-10	.13456* (1.82294)	.13314** (5.44975)	.16986** (4.50454)	.30364** (2.81788)
High School 11	.09995 (1.01453)	.25957** (7.95881)	.25314** (5.30407)	.31497** (2.72506)
High School 12-13	.28577* (2.23271)	.30869** (9.11513)	.34513** (6.41701)	.32874** (3.04095)
Some University	.43209** (2.97057)	.58143** (16.03958)	.45353** (8.31952)	.69869** (6.06957)
Experience				
Experience	.05143** (6.72756)	.06073** (25.89807)	.05438** (13.87722)	.05668** (8.39035)
$(\text{Experience})^2$	-.00088** (-6.05546)	-.00092** (-21.17854)	-.00088** (-12.52359)	-.00085** (-6.50827)

TABLE H-11
(continued)

Variables	Resources	Manufacturing	Transportation/ Communication	Finance
Weeks Worked				
14-26 weeks	.83132** (7.27114)	.76358** (15.22182)	1.08682** (11.37471)	.73945** (3.31393)
27-39 weeks	1.36724** (12.70607)	1.23106** (25.25814)	1.51179** (17.28390)	1.01400** (4.93260)
40-48 weeks	1.70487** (14.75491)	1.57487** (34.62706)	1.86975** (22.46869)	1.40461** (9.19940)
49-52 weeks	1.79759** (17.41671)	1.73735** (42.04412)	2.00910** (27.19698)	1.69239** (13.57833)
Regions				
Urban 30 000+	.30006** (2.47184)	.09877** (3.71678)	.06926 (1.59526)	.01399 (.11668)
Urban 30 000-	.13883** (2.44496)	.10163** (3.40465)	.05713 (1.12455)	.08643 (.64822)
Adjusted R^2	.63184	.65137	.59808	.56524
F Statistic	48.94	365.33	122.52	33.16
# of Individuals	420	2926	1226	372

TABLE H-11
(continued)

Variables	Construction	Trade	Services	Government
Constant	6.23686** (66.31594)	5.70593** (66.14575)	5.79269** (73.87746)	5.98581** (71.87404)
Language				
Unilingual Anglophones	.17692 (1.25465)	.10629 (1.43134)	-.02725 (-.40245)	.14081* (1.66019)
Bilingual Anglophones	.14428 (1.40303)	.25326** (3.84693)	.04706 (.76576)	.12734* (1.72630)
Bilingual Francophones	.02480 (.54208)	.15545** (4.19371)	.05928 (1.60981)	.11810** (3.09477)
Education				
High School 9-10	.09198* (1.74955)	.10806** (2.53114)	.09110* (1.72292)	.13231** (2.52026)
High School 11	.09845 (1.23748)	.23787** (4.37003)	.23489** (3.64881)	.12500** (2.12413)
High School 12-13	.12610 (1.34167)	.22968** (4.00279)	.38822** (6.43114)	.16705** (2.92319)
Some University	.44924** (4.72483)	.51122** (7.67800)	.79427** (15.14827)	.53398** (9.45902)
Experience				
Experience	.07130** (12.28645)	.07406** (18.65298)	.06243** (16.00731)	.05261** (13.38228)
$(\text{Experience})^2$	-.00120** (-11.20928)	-.00121** (-16.33515)	-.00098** (-13.14833)	-.00080** (-10.95633)
Weeks Worked				
14-26 weeks	.74630** (8.58866)	.90271** (10.41523)	.81134** (11.01518)	1.07988** (10.94313)
27-39 weeks	1.22317** (14.97161)	1.37987** (14.96340)	1.36337** (18.71529)	1.50949** (15.80727)

TABLE H-11
(continued)

Variables	Construction	Trade	Services	Government
1-48 weeks	1.43511** (18.15989)	1.74651** (21.16250)	1.69680** (23.06125)	1.86292** (22.02336)
49-52 weeks	1.66240** (20.92982)	1.89438** (25.16318)	1.86413** (30.79226)	1.97736** (29.17853)
Regions				
Urban 30 000 +	.13656** (2.67645)	.04798 (.93710)	.05151 (.98764)	.08221 (1.57354)
Urban 30 000-	.05231 (.54331)	-.02084 (-.36377)	.15211** (2.53025)	.11088* (1.79858)
Adjusted R^2	.57629	.59620	.61492	.67475
F Statistic	74.53	144.51	178.04	137.78
# of Individuals	812	1459	1664	990

TABLE H-12
Regression Results, Final Sample
Broken Down for Seven Industries
Montreal, Males, 1970

Variables	Manufacturing	Transportation/ Communication	Finance	Construction
Constant	6.02589** (75.77625)	6.18735** (62.94314)	5.76667** (25.67923)	6.56248** (39.43128)
Language				
Unilingual Anglophones	.11715** (2.47826)	.21086** (3.37764)	.40724** (3.12697)	.25627* (1.80574)
Bilingual Anglophones	.15092** (2.95169)	.17201** (2.53655)	.44448** (3.31136)	.27078* (2.06543)
Bilingual Francophones	.05867* (1.66850)	.08252* (1.74296)	.33607** (2.82914)	.05046 (.71576)
Education				
High School 9-10	.09730** (2.51619)	.17627** (3.54476)	.17509 (1.46427)	.21655** (2.76100)
High School 11	.21428** (4.57906)	.25152** (3.90818)	.29657** (2.36692)	.03411 (.24512)
High School 12-13	.34725** (7.13689)	.29100** (4.57716)	.34095** (2.78625)	-.06014 (-.43070)
Some University	.64978** (12.88962)	.46318** (6.68231)	.74286** (6.25130)	.37824** (2.56326)
Experience				
Experience	.06803** (18.81668)	.05076** (10.74413)	.06931** (9.06635)	.07182** (7.91345)
$(\text{Experience})^2$	-.00106** (-15.41239)	-.00078** (-9.10656)	-.00111** (-7.68201)	-.00119** (-7.06151)

TABLE H-12
(continued)

Variables	Manufacturing	Transportation/ Communication	Finance	Construction
Weeks Worked				
14-26 weeks	.87259** (9.47463)	.73267** (6.10699)	.91433** (4.13307)	.58314** (3.78260)
27-39 weeks	1.26932** (14.09145)	1.41705** (12.67043)	1.05265** (4.75342)	1.00822** (6.70503)
40-48 weeks	1.66525** (19.62789)	1.66351** (16.27041)	1.73537** (8.20324)	1.27060** (8.79487)
49-52 weeks	1.80798** (23.44759)	1.86190** (20.76275)	1.83192** (9.88242)	1.39204** (9.75792)
Adjusted R^2	.60426	.59390	.63299	.49868
F Statistic	159.10	80.98	36.02	25.18
# of Individuals	1347	712	265	317

TABLE H-12
(continued)

Variables	Trade	Services	Government
Constant	5.75295** (52.27207)	5.57290** (55.15430)	6.27889** (54.71583)
Language			
Unilingual Anglophones	.12439 (1.35608)	-.00868 (-.10079)	-.08063 (-.71024)
Bilingual Anglophones	.21191** (2.48304)	-.08067 (-.93432)	.03041 (.29797)
Bilingual Francophones	.10816* (1.72130)	.00816 (.13522)	-.00569 (-.08966)
Education			
High School 9-10	.15294** (2.34540)	.18814** (2.36455)	.10480 (1.44956)
High School 11	.22243** (2.79455)	.30570** (3.30851)	.24579** (2.97615)
High School 12-13	.27042** (3.21580)	.40357** (4.34621)	.15687* (1.90212)
Some University	.60968** (7.05666)	.84790** (10.59705)	.57567** (6.86757)
Experience			
Experience	.07164** (12.66123)	.06370** (11.35023)	.06237** (9.75452)
$(\text{Experience})^2$	-.00115** (-10.57877)	-.00101** (-9.20353)	-.00103** (-8.44051)
Weeks Worked			
14-26 weeks	.99502** (7.55287)	1.12757** (10.11603)	.62105** (4.43440)
27-39 weeks	1.15666** (9.30083)	1.53686** (13.74077)	1.27717** (9.56539)

TABLE H-12
(continued)

Variables	Trade	Services	Government
40-48 weeks	1.69974** (14.36531)	2.06290** (19.60732)	1.65452** (12.25624)
49-52 weeks	1.94687** (18.75548)	2.19116** (23.94867)	1.85330** (17.06065)
Adjusted R^2	.59059	.64051	.70379
F Statistic	85.22	116.12	73.19
# of Individuals	760	841	396

TABLE H-13
Significance Test of Differences Between
Language Coefficients, Industry Subgroups
(t-statistics in brackets)

	Resources	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.03893 (0.17000)	-
Unilingual Anglophones- Bilingual Francophones	0.14799 (0.80000)	-
Bilingual Anglophones- Bilingual Francophones	0.18692 (0.12345)	-

	Manufacturing	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.3676 (0.85697)	.03377 (0.65725)
Unilingual Anglophones- Bilingual Francophones	0.03546 (1.05487)	0.05848 (1.44848)
Bilingual Anglophones- Bilingual Francophones	0.07222* (2.07618)	0.09225 (1.29161)

	Transportation/ Communication	
	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.13479* (-2.11022)	-0.03885 (-0.57034)
Unilingual Anglophones- Bilingual Francophones	0.13422* (2.68978)	0.12834* (2.51695)
Bilingual Anglophones- Bilingual Francophones	-0.00057 (-0.01161)	0.08949 (1.55782)

TABLE H-13
(continued)

	Finance Quebec	Finance Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.18433* (-1.71442)	0.03724 (0.37277)
Unilingual Anglophones- Bilingual Francophones	0.09845 (1.18093)	0.07117 (0.91199)
Bilingual Anglophones- Bilingual Francophones	0.08588 (-0.90778)	0.10841 (1.22829)

	Construction Quebec	Construction Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.03264 (-0.19351)	0.01451 (0.08379)
Unilingual Anglophones- Bilingual Francophones	0.15212 (1.06689)	0.20581 (1.46820)
Bilingual Anglophones- Bilingual Francophones	0.11948 (1.15398)	0.22032* (1.72568)

	Trade Quebec	Trade Montreal
Bilingual Anglophones- Unilingual Anglophones	0.14697 (1.64317)	0.08752 (0.93244)
Unilingual Anglophones- Bilingual Francophones	-0.04916 (-0.67783)	0.01623 (0.20679)
Bilingual Anglophones- Bilingual Francophones	0.9781* (1.87992)	0.10375 (1.46872)

TABLE H-13
(continued)

Services

	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	0.07431 (0.91469)	-0.07199 (-0.74811)
Unilingual Anglophones- Bilingual Francophones	-0.08653 (-1.32575)	-0.01684 (-0.22463)
Bilingual Anglophones- Bilingual Francophones	-0.01222 (-0.20775)	-0.08883 (-1.16841)

Governments

	Quebec	Montreal
Bilingual Anglophones- Unilingual Anglophones	-0.01347 (-0.13040)	0.11104 (0.85491)
Unilingual Anglophones- Bilingual Francophones	0.02271 (0.35974)	-0.07494 (-0.73591)
Bilingual Anglophones- Bilingual Francophones	0.00924 (0.13120)	0.03610 (0.40823)

Source: TABLES H-11 and H-12

TABLE H-14
Regression Results, Final Sample
Broken Down for Eleven Occupations
Quebec, Males, 1970

Variables	Administration	Applied Sciences	Health/ Teaching	Clerks
Constant	6.39362** (37.90479)	6.79044** (51.08805)	5.69632** (33.91856)	5.98102** (72.51548)
Language				
Unilingual Anglophones	.38225** (5.19305)	.23521** (3.14511)	.04046 (.31210)	.06704 (1.16369)
Bilingual Anglophones	.38278** (5.45341)	.16058* (1.90463)	-.06295 (-.58828)	.09722* (1.77342)
Bilingual Francophones	.16798** (2.92538)	.11950* (1.93947)	.10499* (1.75530)	.15282** (4.22495)
Education				
High School 9-10	.01033 (.12422)	-.01026 (-.10021)	.20450 (1.4458)	.16739** (3.44974)
High School 11	-.00574 (-.06820)	-.01786 (-.16438)	.25950* (1.81252)	.25618** (4.93762)
High School 12-13	.16878* (2.11265)	.12524 (1.21907)	.28156* (2.07007)	.28328** (5.42336)
Some University	.38050** (4.92080)	.37571** (3.82935)	.69028** (5.68619)	.46664** (7.86662)
Experience				
Experience	.04780** (9.99642)	.05559** (9.07679)	.06722** (9.68650)	.05492** (15.88888)
$(\text{Experience})^2$	-.00071** (-7.82064)	-.00093** (-6.85936)	-.00111** (-7.28224)	-.00085** (-13.00777)
Weeks Worked				
14-26 weeks	.88385** (4.81564)	.31080** (2.33752)	1.24472** (10.26508)	.74970** (9.77028)

TABLE H-14
(continued)

Variables	Administration	Applied Sciences	Health/ Teaching	Clerks
27-39 weeks	1.25687** (7.36610)	.80157** (6.03100)	1.72419** (14.51794)	1.28230** (16.10115)
40-48 weeks	1.67682** (11.19907)	1.20929** (8.99305)	2.08224** (16.21030)	1.64732** (23.12177)
49-52 weeks	1.74932** (12.75116)	1.52325** (14.65045)	2.11794** (20.85655)	1.84045** (32.76806)
Regions				
Urban 30 000 +	.13027 (1.44510)	-.04143 (-.48331)	.00334 (.03589)	-.00805 (-.14047)
Urban 30 000-	.07686 (.84544)	-.10457 (-1.05673)	.03869 (.37743)	.07582 (1.51921)
Adjusted R^2	.46204	.68878	.62020	.67180
F Statistic	42.40	60.46	68.82	174.30
# of Individuals	724	404	624	1271

TABLE H-14
(continued)

Variables	Sales	Primary Workers	Processing Workers	Assembly Workers
Constant	5.68883** (53.22745)	5.91970** (48.93968)	6.18673** (73.97132)	6.12380** (86.69445)
Language				
Unilingual Anglophones	.16955* (2.14790)	.18187 (.81698)	.05346 (.58725)	.09281* (1.73921)
Bilingual Anglophones	.31750** (4.52634)	.19902 (.94949)	.33055** (2.97858)	.11076* (1.99331)
Bilingual Francophones	.20074** (4.24163)	.11545 (1.40397)	.09399** (2.33445)	.07533** (2.80063)
Education				
High School 9-10	.09584* (1.70529)	.14979* (1.86363)	.08812* (1.96301)	.14175** (4.62600)
High School 11	.26648** (4.02933)	.18714* (1.76388)	.14194* (2.03272)	.28247** (6.58116)
High School 12-13	.23819** (3.54979)	.09304 (.64746)	.28066** (3.65327)	.23412** (4.83091)
Some University	.50675** (6.87472)	.65903** (3.27658)	.07652 (.84815)	.40220** (6.11281)
Experience				
Experience	.07684** (16.06170)	.05616** (6.71886)	.05552** (11.54933)	.06060** (17.84672)
$(\text{Experience})^2$	-.00125** (-13.66508)	-.00093** (-5.72459)	-.00085** (-9.84111)	-.00093** (-14.69778)
Weeks Worked				
14-26 weeks	.87700** (8.04662)	1.12313** (9.43323)	.76372** (8.37912)	.72747** (10.01417)
27-39 weeks	1.39396** (11.86798)	1.67596** (14.93575)	1.15085** (11.98953)	1.23023** (17.80901)

TABLE H-14
(continued)

Variables	Sales	Primary Workers	Processing Workers	Assembly Workers
40-48 weeks	1.73137** (17.20992)	1.92272** (15.72137)	1.53532** (17.94968)	1.53029** (23.16189)
49-52 weeks	1.98331** (22.55132)	2.00825** (17.87051)	1.63104** (20.92882)	1.67364** (26.87761)
Regions				
Urban 30 000 +	.00160 (.02246)	.08901 (.77861)	.14201** (3.15186)	.09105** (2.65236)
Urban 30 000-	-.07385 (-.93488)	.10609* (1.71578)	.13459** (2.72551)	.11492** (2.95572)
Adjusted R^2	.61703	.68836	.61702	.56626
F Statistic	114.64	47.68	89.50	147.83
# of Individuals	1059	318	825	1688

TABLE H-14
(continued)

Variables	Transportation Workers	Construction Workers	Services
Constant	6.18524** (57.22261)	6.15426** (78.44658)	5.95296** (66.14895)
Language			
Unilingual Anglophones	.13648 (1.61468)	.05536 (.59234)	.10953 (1.23605)
Bilingual Anglophones	.12568 (1.64307)	.07930 (.85132)	.12760 (1.61401)
Bilingual Francophones	.07378* (1.83640)	.03297 (.88492)	.16192** (3.62789)
Education			
High School 9-10	.16332** (3.67676)	.12111** (2.75731)	.09454* (1.68880)
High School 11	.17608** (2.36502)	.15451** (2.32763)	.16562* (2.25419)
High School 12-13	.20921** (2.41697)	.17818** (2.37503)	.26788** (3.46617)
Some University	.26404** (2.48321)	.36172** (4.03186)	.33113** (3.35702)
Experience			
Experience	.06003** (10.88341)	.06303** (13.23514)	.06089** (12.36064)
$(\text{Experience})^2$	-.00097** (-9.63949)	-.00102** (-12.07324)	-.00095** (-11.29733)
Weeks Worked			
14-26 weeks	.57283** (5.19394)	.95331** (12.26581)	.65634** (7.03740)
27-39 weeks	1.14456** (11.00355)	1.32504** (18.25414)	1.15317** (12.24607)

TABLE H-14
(continued)

Variables	Transportation Workers	Construction Workers	Services
40-48 weeks	1.50902** (14.80240)	1.63006** (22.41222)	1.46510** (17.03354)
49-52 weeks	1.62525** (17.09771)	1.77321** (26.14400)	1.69922** (23.32136)
Regions			
Urban 30 000+	.09253* (1.97042)	.11277** (2.74587)	.07031 (1.18314)
Urban 30 000-	.09403* (1.67421)	.08092* (1.70345)	.19295** (2.77540)
Adjusted R^2	.52353	.59736	.59774
F Statistic	60.55	106.24	107.59
# of Individuals	814	1065	1077

TABLE H-15

Regression Results, Final Sample broken down for ten Occupations, Montreal, males, 1970

Variables	Administration	Applied Sciences	Health / Teaching	Clerks
Constant	5.80029**	6.91902**	5.72637**	5.84637**
	(14.29984)	(34.55559)	(24.80286)	(63.36611)
Language				
Unilingual Anglophones	.26859*	.38450**	- .00089	.09990
	(2.26289)	(3.60033)	(- .00602)	(1.44436)
Bilingual Anglophones	.27798*	.30391**	.08847	.14274*
	(2.26832)	(2.78416)	(.58892)	(1.91338)
Bilingual Francophones	.14881	.22357*	.06463	.12229*
	(1.31610)	(2.29338)	(.58476)	(2.18598)
Education				
High School 9-10	.19058	- .13138	.10569	.06193
	(1.60228)	(-1.02516)	(.47173)	(.96665)
High School 11	.10926	- .08680	.32006	.12220*
	(.91226)	(- .65883)	(1.38545)	(1.75557)
High School 12-13	.22844*	- .02098	.23210	.17698**
	(1.99826)	(- .16612)	(1.01721)	(2.54119)
Some University	.50596**	.31884**	.78157**	.42950**
	(4.54018)	(2.65379)	(3.89798)	(5.45569)
Experience				
Experience	.05550**	.03181**	.06059**	.06242**
	(8.05539)	(4.21626)	(5.40928)	(11.80397)
$(\text{Experience})^2$	- .00082**	- .00041**	- .00089**	- .00010**
	(-5.89603)	(-2.27267)	(-3.53322)	(-9.69964)
Weeks Worked				
14 to 26 weeks	1.31469**	- .01684	1.10508**	.96351**
	(3.18679)	(- .09586)	(5.73206)	(9.62775)
27 to 39 weeks	2.01522**	.86601**	1.44325**	1.36806**
	(4.85226)	(4.50216)	(7.90008)	(13.23279)
40 to 48 weeks	2.33793**	1.46594**	1.93618**	1.85289**
	(6.01222)	(7.99809)	(9.56002)	(18.32072)
49 to 52 weeks	2.34213**	1.54229	2.12592**	2.01250**
	(6.14282)	(9.78250)	(13.16712)	(24.96407)
Adjusted R^2	.33900	.73072	.62549	.68626
F Statistic	20.09	53.39	38.39	126.35
# of Individuals	485	252	292	746

TABLE H-15
(continued)

Variables	Sales	Processing Workers	Assembly Workers	Transportation Workers
Constant	5.45371** (37.61868)	5.86695** (40.32328)	6.63185** (65.46073)	6.36769** (39.78830)
Language				
Unilingual Anglophones	.25317* (2.23288)	.38568** (2.58013)	.04523 (.80208)	- .11184 (- .90952)
Bilingual Anglophones	.35485** (3.34010)	.19959 (1.37346)	.07174 (1.08449)	.00694 (.06012)
Bilingual Francophones	.25312** (2.80719)	.20487** (3.25792)	.01927 (.51947)	- .03163 (- .48814)
Education				
High School 9-10	.07423 (.88220)	.11345 (1.53020)	.13765** (3.41026)	.17804** (2.64124)
High School 11	.30542** (3.27953)	.14699 (1.34525)	.11675* (2.05120)	.26239* (2.18932)
High School 12-13	.30171** (3.14974)	.39049** (3.05526)	.23524** (4.01698)	.50838** (2.91372)
Some University	.61422** (6.33646)	.91543** (5.42802)	.42071** (5.00857)	.28374** (1.81867)
Experience				
Experience	.07196** (11.92182)	.06399** (6.94863)	.06097** (13.82727)	.05636** (6.42341)
$(\text{Experience})^2$	- .00110** (-9.73479)	- .00102** (-6.02691)	- .00097** (-11.94696)	- .00092** (-5.9 035)
Weeks Worked				
14 to 26 weeks	1.20469** (7.27425)	1.28804** (7.03401)	.48771 (4.34768)	.59591 (3.55549)
27 to 39 weeks	1.39075** (9.02010)	.90210** (4.89559)	.82510** (7.67209)	1.12696 (7.22907)
40 to 48 weeks	1.81992** (12.75973)	1.87055** (11.39521)	1.19060** (11.56387)	1.50143** (10.26657)
49 to 52 weeks	2.10296** (16.71304)	1.94693** (12.59749)	1.35476** (14.00825)	1.62974** (12.09052)
Adjusted R^2	.59379	.72879	.52676	.48033
F Statistic	69.70	44.20	67.27	27.59
# of Individuals	612	210	770	374

TABLE H-15
(continued)

Variables	Construction Workers	Services
Constant	6.32363**	5.82366**
	(48.36297)	(50.40788)
Language		
Unilingual Anglophones	.18398*	- .09450
	(1.73617)	(- .72716)
Bilingual Anglophones	.24032*	- .15753
	(1.93267)	(-1.42723)
Bilingual Francophones	.07438	.0692
	(1.21887)	(1.00862)
Education		
High School 9-10	.21214**	.16891*
	(3.15510)	(2.16607)
High School 11	.14824	.37738**
	(1.41025)	(3.85451)
High School 12-13	.23765*	.30958**
	(2.14129)	(2.76846)
Some University	.27139*	.27479*
	(1.99100)	(2.21127)
Experience		
Experience	.06500**	.06102**
	(9.30380)	(8.69771)
$(\text{Experience})^2$	- .00103**	- .00099**
	(-8.16854)	(-8.05117)
Weeks Worked		
14 to 26 weeks	.84167**	.91125**
	(6.12045)	(6.89932)
27 to 39 weeks	1.27676**	1.33428**
	(10.31024)	(9.60259)
40 to 48 weeks	1.53588**	1.73442**
	(13.07156)	(13.82613)
49 to 52 weeks	1.60947**	2.00201**
	(14.56943)	(18.17335)
Adjusted R^2	.53159	.64566
F Statistic	36.44	68.42
# of Individuals	407	482

TABLE H-16

Significance test of Differences Between
Language Coefficients, Occupation Subgroups
(t-statistics in brackets)

Administration

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.00053 (0.00815)	0.00939 (0.12661)
Unilingual Anglophones - Bilingual Francophones	0.21427* (3.95173)	0.11978 (1.99910)
Bilingual Anglophones - Bilingual Francophones	0.21480* (4.25367)	0.12917* (1.95398)

Applied Sciences

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-0.07463 (-0.92567)	-0.08059 (-1.09873)
Unilingual Anglophones - Bilingual Francophones	0.11571* (2.04879)	0.16093* (2.61407)
Bilingual Anglophones - Bilingual Francophones	0.04108 (0.58271)	0.08034* (2.45702)

Health / Teaching

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-0.10341 (-0.68575)	0.08936 (0.55472)
Unilingual Anglophones - Bilingual Francophones	-0.06453 (-0.52255)	-0.06554 (-0.52075)
Bilingual Anglophones - Bilingual Francophones	-0.16794* (-1.68192)	0.02382 (0.19404)

TABLE H-16
(continued)

Clerks

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.03108 (0.45759)	0.04284 (0.59125)
Unilingual Anglophones - Bilingual Francophones	-0.08578 (-1.61820)	-0.02239 (-0.40810)
Bilingual Anglophones - Bilingual Francophones	-0.05560 (-1.11200)	0.02045 (0.32915)

Sales

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.14795* (1.69599)	0.10168 (1.06414)
Unilingual Anglophones - Bilingual Francophones	-0.03119 (-0.42883)	0.00005 (0.00061)
Bilingual Anglophones - Bilingual Francophones	0.11676* (1.87447)	0.10173 (1.43012)

Primary Workers

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.01715 (0.05697)	- -
Unilingual Anglophones - Bilingual Francophones	0.06642 (0.28532)	- -
Bilingual Anglophones - Bilingual Francophones	0.08357 (0.37112)	- -

TABLE H-16
(continued)

Processing Workers

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.27709* (2.01128)	-0.18609 (-0.96289)
Unilingual Anglophones - Bilingual Francophones	-0.04053 (-0.43781)	0.18081 (1.23599)
Bilingual Anglophones - Bilingual Francophones	0.23656* (2.11164)	-0.00528 (-0.03680)

Assembly Workers

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.01795 (0.24988)	0.02651 (0.35300)
Unilingual Anglophones - Bilingual Francophones	0.01748 (0.32859)	0.02596 (0.49236)
Bilingual Anglophones - Bilingual Francophones	0.03543 (0.63328)	0.05247 (0.81944)

Transportation

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	-0.01080 (-0.10228)	0.11878 (0.80050)
Unilingual Anglophones - Bilingual Francophones	0.06270 (0.08385)	-0.08021 (-0.67959)
Bilingual Anglophones - Bilingual Francophones	0.05190 (0.68743)	0.03857 (0.35904)

TABLE H-16
(continued)

Construction Workers

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.02394 (0.18873)	0.05634 (0.38379)
Unilingual Anglophones - Bilingual Francophones	0.02239 (0.23680)	0.10960 (1.10996)
Bilingual Anglophones - Bilingual Francophones	0.04633 (0.49082)	0.16594 (1.36587)

Services

	Quebec	Montreal
Bilingual Anglophones - Unilingual Anglophones	0.01807 (0.16607)	-0.06303 (-0.42104)
Unilingual Anglophones - Bilingual Francophones	-0.05239 (-0.59473)	-0.16242 (-1.33508)
Bilingual Anglophones - Bilingual Francophones	-0.03432 (-0.44233)	-0.22545* (-2.20542)

APPENDIX I

GROSS/NET EARNINGS COMPARISONS

AND

HUMAN CAPITAL/ETHNICITY BREAKDOWNS

TABLE I-1

Gross and Net Earnings Differences, Quebec and Montreal, Four Age Groups, 1970, males

Percentage gain over an Unilingual Francophone				
	Quebec		Montreal	
Age Groups	Gross	Net	Gross	Net
25-34				
Unilingual Anglophones	44	18.6	42	14.0
Bilingual Anglophones	54	23.5	27	-
Bilingual Francophones	28	12.1	24	7.8
35-44				
Unilingual Anglophones	74	29.2	77	23.1
Bilingual Anglophones	69	25.7	70	23.1
Bilingual Francophones	36	12.1	37	10.2
45-54				
Unilingual Anglophones	93	32.6	96	32.4
Bilingual Anglophones	73	22.3	111	34.3
Bilingual Francophones	43	9.0	35	11.1
55-64				
Unilingual Anglophones	82	15.9	79	37.6
Bilingual Anglophones	63	11.0	76	31.9
Bilingual Francophones	38	-	33	-

Source: Tables A-4, A-13, H-5, H-6

TABLE I-2

Gross and Net Earnings Differences, Quebec and Montreal, Five Educational Groups, 1970, males

Percentage gain over an Unilingual Francophone				
	Quebec		Montreal	
Educational Group	Gross	Net	Gross	Net
Primary or less				
Unilingual Anglophones	12	-	26	12.4
Bilingual Anglophones	23	15.0	16	-
Bilingual Francophones	20	8.4	14	-
High School 9-10				
Unilingual Anglophones	51	16.2	48	-
Bilingual Anglophones	50	18.2	55	15.5
Bilingual Francophones	35	13.4	26	-
High School 11				
Unilingual Anglophones	64	16.5	62	-
Bilingual Anglophones	75	22.1	93	-
Bilingual Francophones	37	10.5	48	-
High School 12-13				
Unilingual Anglophones	147	22.3	145	42.2
Bilingual Anglophones	119	17.5	147	44.8
Bilingual Francophones	58	11.5	67	17.3

TABLE I-2
(continued)

Percentage gain over an Unilingual Francophone				
	Quebec		Montreal	
Educational Group	Gross	Net	Gross	Net
Some University				
Unilingual Anglophones	73	20.2	73	27.9
Bilingual Anglophones	47	-	45	22.0
Bilingual Francophones	37	-	49	18.4

Source: Tables A-3, A-12, H-8, H-9.

TABLE I-3

The returns to Ethnicity and Human Capital, Percentage Share, Four Age Groups, Males, 1970

	QUEBEC	MONTREAL
	AGE GROUP: 25-34	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	22.4	28.9
Ethnicity:	21.1	14.8*
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	51.5	55.7*
Ethnicity:	48.5	44.3*
	AGE GROUP: 35-44	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	17.5	14.6
Ethnicity:	19.7	18.4
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	47.1	44.2
Ethnicity:	52.9	55.8

TABLE I-3
(continued)

	QUEBEC	MONTREAL
	AGE GROUP: 45-54	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	12.3	10.0
Ethnicity:	18.2	20.9
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	40.3	32.4
Ethnicity:	59.7	67.6
	AGE GROUP: 55-64	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	-	-
Ethnicity:	17.5	42.0
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	-	-
Ethnicity:	100.0	100.0

Source: Table I-1

TABLE I-4

The returns to Ethnicity and Human Capital, Percentage Share, Five Education Group, Males, 1970

	QUEBEC	MONTREAL
	EDUCATION GROUP: PRIMARY OR LESS	
Share of Gross earnings differences attributed to:		
Linguistics Human Capital:	36.5	-
Ethnicity:	28.7	47.7*
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	56.0	-
Ethnicity:	44.0	100.0*
	EDUCATION GROUP: HIGH SCHOOL 9-10	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	26.8	-
Ethnicity:	9.6	28.2
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	73.6	-
Ethnicity:	26.4	100.0

TABLE I-4
(continued)

	QUEBEC	MONTREAL
	EDUCATION GROUP: HIGH SCHOOL 11	
Share of Gross earnings difference attributed to:		
Linguistic Human Capital:	14.0	-
Ethnicity:	15.5	-
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	47.5	-
Ethnicity:	52.5	-
	EDUCATION GROUP: HIGH SCHOOL 12-13	
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	9.7	11.8
Ethnicity:	5.0	18.7
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	65.7	38.6
Ethnicity:	34.3	61.4

TABLE I-4
(continued)

	QUEBEC	MONTREAL
	EDUCATION GROUP:	SOME UNIVERSITY
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	-	40.9
Ethnicity:	27.7*	8.0
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	-	83.6
Ethnicity:	100.0*	16.4

*Source: Table I-2.

TABLE I-5

Gross and Net Earnings Differences, Quebec and Montreal, Eleven Occupations, 1970, males

Percentage gain over an Unilingual Francophones				
	Quebec		Montreal	
Occupational Groups	Gross	Net	Gross	Net
Administration				
Unilingual Anglophones	104	46.5	71	30.9
Bilingual Anglophones	100	46.7	74	32.0
Bilingual Francophones	46	18.3	39	16.1*
Applied Sciences				
Unilingual Anglophones	77	26.5	78	46.8
Bilingual Anglophones	45	17.5	49	35.5
Bilingual Francophones	37	12.6	37	25.1
Health/Teaching				
Unilingual Anglophones	27	-	66	-
Bilingual Anglophones	22	-	34	-
Bilingual Francophones	33	11.1	44	-
Clerks				
Unilingual Anglophones	23	-	23	-
Bilingual Anglophones	21	10.2	10	15.4
Bilingual Francophones	23	16.5	21	13.0

*The regression coefficient is significant at the ninety-percent level.

TABLE I-5
(continued)

Percentage gain over an Unilingual Francophone				
	Quebec		Montreal	
Occupational Groups	Gross	Net	Gross	Net
Sales				
Unilingual Anglophones	70	18.5	91	28.8
Bilingual Anglophones	78	37.3	124	42.6
Bilingual Francophones	50	22.3	65	28.8
Primary Workers				
Unilingual Anglophones	97	-	-	-
Bilingual Anglophones	56	-	-	-
Bilingual Francophones	23	-	-	-
Processing Workers				
Unilingual Anglophones	24	-	81	47.1
Bilingual Anglophones	21	39.2	101	-
Bilingual Francophones	24	9.8	30	22.7
Assembly Workers				
Unilingual Anglophones	36	9.7	30	-
Bilingual Anglophones	30	11.7	20	-
Bilingual Francophones	20	7.8	15	-

TABLE I-5
(continued)

Percentage gain over an Unilingual Francophone				
	Quebec		Montreal	
Occupational Groups	Gross	Net	Gross	Net
Transportation Workers				
Unilingual Anglophones	47	-	16	-
Bilingual Anglophones	31	-	0	-
Bilingual Francophones	20	7.7	7	-
Construction Workers				
Unilingual Anglophones	29	-	31	20.2
Bilingual Anglophones	26	-	41	27.1
Bilingual Francophones	22	-	20	-
Services				
Unilingual Anglophones	50	-	13	-
Bilingual Anglophones	29	-	18	-
Bilingual Francophones	33	17.6	41	-

Source: Tables A-1, A-10, H-14, H-15.

TABLE I-6

The returns to Ethnicity and Human Capital, Percentage Share, Occupation Groups, Males, 1970

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	ADMINISTRATION
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	18.3	22.7
Ethnicity:	28.4	21.5
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	39.2	50.3
Ethnicity:	60.8	49.7
	OCCUPATION GROUP:	APPLIED SCIENCES
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	28.0	51.2
Ethnicity:	10.9	21.2
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	72.0	70.7
Ethnicity:	28.0	29.3

TABLE I-6
(continued)

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	HEALTH/TEACHING
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	50.4	-
Ethnicity:	-	-
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	-	-
Ethnicity:	-	-
	OCCUPATION GROUP:	CLERKS
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	78.6	130.0
Ethnicity:	-30.0	24.0
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	161.8	84.4
Ethnicity:	-61.8	15.6

TABLE I-6
(continued)

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	SALES
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	28.6	23.2
Ethnicity:	19.2	11.1
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	59.8	67.6
Ethnicity:	40.2	32.4

NOTE: No results could be computed for Primary Workers.

TABLE I-6
(continued)

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	PROCESSING WORKERS
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	46.7	28.0*
Ethnicity:	140.0	30.1*
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	25.0	48.2*
Ethnicity:		51.8*
	OCCUPATION GROUP:	ASSEMBLY WORKERS
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	26.0	-
Ethnicity:	13.0	-
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	66.7	-
Ethnicity:	33.3	-

TABLE I-6
(continued)

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	TRANSPORTATION WORKERS
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	24.8	-
Ethnicity:	-	-
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	-	-
Ethnicity	-	-
	OCCUPATION GROUP:	CONSTRUCTION WORKERS
Share of Gross earnings differences attributed to:		
Linguistic Human Capital:	-	-
Ethnicity:	-	66.1
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	-	
Ethnicity:	-	100.0

TABLE I-6
(continued)

	QUEBEC	MONTREAL
	OCCUPATION GROUP:	SERVICES
Share of Gross earnings differences attributed:		
Linguistic Human Capital:	60.7	-
Ethnicity:	-	-
Share of Net earnings differences attributed to:		
Linguistic Human Capital:	100.0	-
Ethnicity:	-	-

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